HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Ringold Springs Hatchery - Fall Chinook
Species or Hatchery Stock:	Columbia River Upriver Bright (URB) Fall Chinook *Oncorhynchus tshawytscha*
Agency/Operator:	Washington Department of Fish and Wildlife United States Army Corp of Engineers
Watershed and Region:	Mid-Columbia River, Columbia River
Date Submitted:	
Date Last Updated:	August 19, 2014

Executive Summary

ESA Permit Status:
In 2005 the Washington Department of Fish and Wildlife (WDFW) submitted a Hatchery Genetic Management Plan (HGMP) for the Ringold Springs Hatchery (RSH) fall Chinook 3.5M on-station release sub-yearling program. The Washington Department of Fish and Wildlife (WDFW) and the U.S. Army Corps of Engineers (USACE) are now re-submitting an HGMP for the Ringold Springs Hatchery fall Chinook for this sub-yearling program to further update the description of the program, including the broodstock source, the proposed program expansion from 3.5M to 14.65M total releases both on-station at a newly upgraded Ringold facility, and a newly constructed I-182 Acclimation Site on the Yakima River, set to take place by 2018. The 14.65 million include the 1.7 million funded by the ACOE that is currently released from Priest Rapids hatchery, the 3.5 million currently released at the Ringold facility, and 1.7 million currently released at the Prosser Hatchery in the Yakima River. The result is an additional 7.75 million sub-yearlings to be released at the Ringold facility. A proportion of the sub-yearling production released at the I-182 Acclimation Site may be replaced by yearling smolts, reducing the total number of fish released at that facility. The purpose of this program expansion is to partially meet the mitigation responsibilities of the USACE for inundating Upriver Bright (URB) fall Chinook salmon spawning habitat by the construction and operation of John Day and The Dalles dams. "In place/in kind" fish production mitigation is required under the Flood Control Act of 1950, House Document 531 and the *United States v. Oregon* (*U.S. v. Oregon*) Federal District Court case that applied the 1979 Supreme Court decision addressing tribal treaty rights.

Fall Chinook in the Upper Columbia and the Priest Rapids and Ringold Springs Hatchery Chinook stocks are not listed under Endangered Species Act (ESA).

Ringold Springs Hatchery Chinook Program:
Ringold Springs was initially built as part of the NMFS-funded Columbia River Fisheries Development Program. The primary goal of upriver bright (URB) Chinook production is to replace losses of wild URB Chinook contributions to Treaty and non-Treaty sport and commercial fisheries due to federal hydropower and habitat degradation in the Columbia River Basin. The Ringold facility will be rebuilt into a full scale hatchery to accommodate the proposed program increase of releases of 10.4 million fall Chinook on-station (located on the Columbia River, at Rkm 567) and provide an additional 4.25 million off-station release from the I-182 Acclimation Site on the Yakima River (located at approx. Rkm 7.5). The facility details listed in this HGMP will refer to the newly proposed upgraded Ringold facility and associated I-182 Acclimation site tentatively scheduled to begin construction in 2017-2018. Construction of the new facilities is dependent on acquiring funding at the national level; a request funding is being submitted in fall of 2015. If the funding is obtained, the total production increase of the program to 14.65M (from 6.9 million) released into the Columbia River would begin annually by 2019.

The program is operated as an "integrated" program with the intent to minimize the genetic and reproductive fitness differences between the locally derived hatchery broodstock and the naturally spawning population. To achieve this, WDFW will use the FWC Policy C-3619 for guidance for hatchery reform actions while working with the co-managers/tribes and in a manner that is consistent with the U.S v. Oregon Agreement. HSRG recommendations are implemented to degree there is agreement among the parties.

Risk control measures are also in place to address other potential hazards including genetic and ecological interactions with ESA-listed species, disease transmission, and facility effects.

Harvest:
The program is operated to mitigate for the loss of wild salmon harvest due to federal hydropower construction and habitat degradation in the Columbia River Basin. The program goal is to provide 54,213

adult URB fall chinook for harvest in treaty and non-treaty, sport and commercial fisheries, while minimizing adverse effects on ESA-listed stocks, especially Snake River fall Chinook. URB Chinook production from Ringold and the parent Priest Rapids Hatchery program contributes significantly to ocean, Columbia River commercial and recreational fisheries, and Treaty Indian fisheries in Zone 6. Harvest of these fall Chinook takes place in: the Canadian Troll fishery, the Canadian sport and net fisheries, the Washington/Oregon coastal sport and troll fisheries, Alaskan sport and troll fisheries, Columbia River net and freshwater sport fisheries and Treaty Indian fisheries in Zone 6.

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Ringold Springs Hatchery - (URB) Fall Chinook Program.

1.2) Species and population (or stock) under propagation, and ESA status.

Columbia River fall Chinook - *(Oncorhynchus tshawytscha)*
ESA Status: Not listed and not a candidate for listing.

1.3) Responsible organization and individuals

Hatchery Operations Staff Lead Contacts

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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

U.S. Army Corps of Engineers (USACE): John Day Mitigation funding entity

Oregon Department of Fish & Wildlife: Program Participant- Egg incubation and early fry rearing at Bonneville Fish Hatchery located at RM

0.25 on Tanner Creek in the lower Columbia River watershed.

Yakama Nation/Confederated Tribes of the Umatilla Indian Reservation:

Program Participant- Operator of I-182 for broodstock collection and acclimation

1.4) Funding source, staffing level, and annual hatchery program operational costs.

Funding Source	Operational Information
U.S. Army Corps of Engineers (John Day Mitigation Funds)	Full time equivalent staff – 3 Annual operating cost (dollars) - $2,100,000

1.5) Location(s) of hatchery and associated facilities.

Broodstock source(s)	Ringold Springs Hatchery, Priest Rapids Hatchery , I-182 Collection Ponds/Acclimation site
Broodstock collection location(s) (stream, Rkm, sub-basin)	Columbia River, 567 Rkm (Ringold) Columbia River, 662 Rkm (Priest Rapids), potentially at Yakima R. R.Km 7.5 (I-182 Collection Ponds)
Adult holding location (stream, Rkm, sub-basin)	Columbia River, 567 Rkm and potentially at I-182 Collection Ponds/Acclimation site in Yakima River (at approx. RM 3.0; Rkm 7.5)
Spawning location (stream, Rkm, sub-basin)	Columbia River, 567 Rkm
Incubation location (facility name, stream, Rkm, sub-basin)	Ringold Springs Rearing Facility - Columbia River, 567 Rkm
Rearing location (facility name, stream, Rkm, sub-basin)	Ponding, rearing of 14.65M and 10.4 M on-station release to occur at Ringold Springs Hatchery - Columbia River, 567 Rkm , Bonneville Hatchery, lower Columbia, 235 Rkm.
Acclimation and Release location (facility name, stream, Rkm, sub-basin)	Potential Acclimation and release of up to 4.25 M to occur at I-182 Collection Ponds/Acclimation Site (Lat 46 15’ 32.1”N Long 119 17’ 32.9”W) on the right bank of the Yakima River (at approx. RM 3.0; Rkm 7.5)

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Figure 1.5.1: Ringold Springs Hatchery Facility and Proximity to I-182 Acclimation Site.
Source: Tetra Tech DDR 2014.

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Figure 1.5.2: I-182 Acclimation Facility - Vicinity Map.
Source: Tetra Tech DDR 2014.

1.6) Type of program.

Integrated Harvest. Ringold Springs Hatchery stock is derived from and integrated with URB Chinook from the Hanford Reach.

1.7) Purpose (Goal) of program.

Mitigation – Ringold Springs Rearing Facility was initially built as part of the NMFS-funded Columbia River Fisheries Development Program. The primary goal of upriver bright (URB) Chinook production is to replace losses of wild URB Chinook contributions to Treaty and non-Treaty sport and commercial fisheries due to federal hydropower and habitat degradation in the Columbia River Basin. The program goal is to provide 54,213 adult URB fall chinook for harvest in treaty and non-treaty, sport and commercial fisheries, while minimizing adverse effects on ESA-listed stocks, especially Snake River fall Chinook. This facility will be rebuilt into a full scale hatchery to accommodate an increase in on-station releases of 10.4M fall Chinook and provide up to an additional 4.25M off-station release from the I-182 Acclimation Site on the Yakima River which would be a combination of sub-yearling and yearling production. The production at this facility would be a combination of sub-yearling and yearling production, which would reduce the total number of juveniles released at the I-182 facility while still maintaining the total number of adults expected to be produced. Yearling fish would be reared at Bonneville Hatchery before coming to I-182 for acclimation. The facility details listed in this HGMP will refer to the newly proposed upgraded Ringold facility and associated I-182 Acclimation Site tentatively scheduled to begin construction in 2015-2016. These new programs are dependent on the USACE securing funding for the construction and operations of these proposed facilities. If funding is not secured, the current 3.5 million fish released from Ringold will continue.

The purpose of this program is to partially meet the mitigation responsibilities of the USACE for inundating URB fall Chinook salmon spawning habitat by the construction and operation of John Day and The Dalles dams. "In place/in kind" fish production mitigation is required under the Flood Control Act of 1950, House Document 531 and the *United States v. Oregon* (*U.S. v. Oregon*) Federal District Court case that applied the 1979 Supreme Court decision addressing tribal treaty rights.

The 2008 Federal Columbia River Power System (FCRPS) Biological Opinion (BiOp) and the Columbia River Treaty-Tribe Fish Accords (Accords) include actions to evaluate John Day Mitigation hatchery production. Reasonable and Prudent Alternative (RPA) Measure 40 of the BiOp states: "The Action Agencies will undertake/fund reforms to ensure that hatchery programs funded by the Action Agencies as mitigation for the FCRPS are not impeding recovery. For Lower Columbia Chinook the USACE will review the John Day Hatchery Mitigation Program."

The Accords state: "The U.S. Army Corps of Engineers and *U.S. v. Oregon* parties are working on proposals regarding mitigation for the losses to anadromous fish caused by the construction of John Day and The Dalles dams, in particular the appropriate balance between upriver and downriver stock production…"

In 2012, the Portland District USACE produced the John Day Mitigation Alternative Study. The purpose of this study is to evaluate alternatives for increasing the number of upriver bright fall Chinook through the Zone 6 Tribal Fishery (Bonneville to McNary Dams), while minimizing effects on Endangered Species Act (ESA) listed Lower Columbia River Chinook.

Currently mitigation is provided by a combination of adult egg take, incubation and juvenile rearing using a combination of Priest Rapids Hatchery (WDFW), Ringold Springs Hatchery (WDFW), Little White Salmon and Spring Creek National Fish Hatchery (USFWS), Prosser Hatchery (Yakima R. at Prosser operated by the Yakama Nation) and Bonneville Hatchery (ODFW). About half of the fall Chinook mitigation fish are upriver Brights (URB), which are released above or just below McNary Dam. The remaining production is comprised of both Tule and upriver Bright fall Chinook, which are released in the Bonneville pool. The goal of the redesigned mitigation program for the Corps of Engineers will be to achieve 107,000 Total Adults Produced (TAP) and to have approximately 75% of the mitigation upstream of Bonneville Dam be comprised of Bright fall Chinook salmon (US v. Oregon Policy Committee Letter dated 7.23.2014). The TAP goal for Ringold on-station production would be 40,088 and for I-182 acclimation site would be 14,125.

1.8) Justification for the program.

The program is operated to partially meet the mitigation responsibilities of the USACE for inundating URB fall Chinook salmon spawning habitat by the construction and operation of John Day and The Dalles dams. "In place/in kind" fish production mitigation is required under the Flood Control Act of 1950, House Document 531 and the *United States v. Oregon* (*U.S. v. Oregon*) Federal District Court case that applied the 1979 Supreme Court decision addressing tribal treaty rights. The goal of this program is to provide 54,213 URB fall chinook for harvest in treaty and non-treaty, sport and commercial fisheries, while minimizing adverse effects on ESA-listed stocks, especially Snake River fall chinook. URB Chinook production from Ringold and the ACOE funded proportion of the Priest Rapids Hatchery program contributes significantly to ocean, Columbia River commercial and recreational fisheries, and Treaty Indian fisheries in Zone 6. Harvest of these fall Chinook takes place in: the Canadian Troll fishery, the Canadian sport and net fisheries, the Washington/Oregon coastal sport and troll fisheries, Alaskan sport and troll fisheries, Columbia River net and freshwater sport fisheries. **See Section 3.3**.

Indicate how the hatchery program will enhance or benefit the survival of the listed natural population (integrated or isolated recovery programs).

In order to minimize impact on ESA-listed fish by WDFW facilities operation and the Ringold URB Fall Chinook program, the following Risk Aversion measures are included in this HGMP:

Table 1.18.1: Summary of risk aversion measures for the Ringold Springs fall Chinook program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	4.2	Ringold Facility: Water rights are formalized thru water rights S3-283301C, S3-00408C, S3-27815C, and S3-27816C issued by the WA Department of Ecology. Monitoring and measurement of water usage is reported in monthly NPDES reports. A new water right will be required with the increased production levels proposed. I-182 Acclimation Site: A new water right will be required.
Intake Screening	4.1, 4.2	Ringold Facility: The river intake is screened with 1mm openings meeting NOAA screen criteria (NMFS 1995, 1996). The river intake screen, if modified, will meet NMFS 2011a screen criteria. The RSH gravity spring water supply does not have fish, listed or unlisted, residing above the four points of diversion. I-182 Acclimation Site: The proposed water supply for the acclimation facilities would be an intake screen and pump station drawing flow from the Yakima River. The intake will consist of a submerged cone screen and pump station designed to meet NOAA Fisheries Guidelines and Criteria (NMFS 2011a), sized to supply a maximum flow of 30 cfs.
Effluent Discharge	4.2	This facility operates and complies with limits under the "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) administered by the Washington Department of Ecology (DOE) - WAG 13-7009 and IHOT 1995 which act to protect the quality of receiving waters adjacent to the hatchery.
Broodstock Collection & Adult Passage	7.9	Listed fish are not collected for this program. There are no adult passage issues with this program.
Disease Transmission	7.9, 10.11	Fish Health Policy in the Columbia Basin. Details hatchery practices and operations designed to stop the introduction and/or spread of any diseases within the Columbia Basin. Also, Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (Genetic Policy Chapter 5, IHOT 1995).

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Competition & Predation	2.2.3, 10.11	Ringold releases Age 0 URB fall chinook smolts in June that are not known to prey on other listed stocks of salmon and steelhead because of [small] size at release and timing. Ringold fish may compete for food resources with listed Snake R. fall chinook downstream from the Snake R. confluence during co-mingled migration to the estuary. Hanford Reach natural-origin URB fall Chinook are not listed. Yearling releases at the I-182 facility may prey on other salmonids because of their larger size and similarly compete for resources with other fish in the migration corridor.

1.9) List of program "Performance Standards".

See also Section 1.10 below for Performance Standards and Indicators referenced from Northwest Power Planning Council (NPPC) Artificial Production Review (APR) (NPPC 2001).

Table 1.9.1: Metrics for Ringold Springs Hatchery (RSH) quantitative objectives to be included in HGMPs.

Metric	Definition or calculation	Why important
Release number and size	Total number and weight of juveniles released	Determines whether or not the program is meeting mitigation production levels consistent with *U.S. vs. Oregon* Management Agreement in order to achieve John Day Mitigation adult objectives. (**See Appendix 3** US v. Oregon Policy Committee Letter dated 3-7-2013).
Proportionate natural influence (PNI)	Proportion of total selection (hatchery and natural) that is due to natural selection. Calculated as pNOB/(pNOB + pHOS) pNOB=proportion of natural origin brood in the hatchery pHOS=proportion of hatchery origin spawners in the natural environment	An approximation of the rate of gene flow between the hatchery program and the natural spawning population
Hatchery SAR	Smolt-adult return rate by brood year	Determines overall hatchery smolt survival. Essential for run-forecasting and out-year mitigation requirements. Also essential to evaluate success of the program and whether program goals are being achieved.
Within hatchery survival	Survival by life stage	Necessary monitoring to assess/maximize the efficacy of hatchery rearing and will guide future hatchery rearing strategies.
Escapement	Number of adults that spawn in the natural environment	Under escapement can harm the viability of the population and over escapement can result in lost harvest opportunity and potentially reduced productivity
Stray rate	Three metrics for evaluating straying: Stray 1=percentage of hatchery release that strays to non-target spawning areas, see table 2.2.3.2, Stray 2=percentage of a non-target spawning population that contains hatchery strays, see table 2.2.3.3, Stray 3=percentage of non-target populations that stray	Straying into non-target populations has the potential to reduce productivity of non-target populations and reduce between population diversity. Strays from other programs could impact the target population.

	into targeted population, see 2.2.3.4	
Relative productivity	Productivity of hatchery and natural origin fish in the hatchery and the natural environment across generations. This includes: freshwater productivity (e.g., The number of juveniles / redd or juveniles / spawner. Juveniles may be measured at different life-stages such as parr, emigrants, or smolts), Hatchery and natural origin adult recruits/spawner and hatchery smolt-to-adult recruitment (SAR).	It is important to know whether natural productivity is increasing, stable, or decreasing over time and assess factors that might be affecting natural productivity at various life stages. This information can be used to inform and identify potential adaptive management options for the program.
Genetic Diversity	Effective population size	Genetic diversity within and between populations is associated with increased productivity and long-term fitness.
Biological characteristics of adult hatchery and natural origin offspring.	Size at age, age at maturation, return and spawn timing, sex ratio, fecundity, egg size, spawn location	Changes in these phenotypic characteristics over time have the potential to affect natural productivity. It is important to monitor these characteristics to inform and identify potential adaptive management options for the program.
Harvest	Number of fish to be harvested in all fisheries	Contributes value to commercial, subsistence, and recreational fisheries, and is important for spiritual/cultural reasons.
Non-target taxa of concern (NTTOC)	% impact to a tax on baseline abundance, size, or distribution A risk assessment will be conducted that will identify which NTTOC, if any, will be monitored and will help inform the frequency and intensity of monitoring. The containment objectives need to be consistent with methodologies developed through HCP and Settlement Agreements.	It is important to know whether the program might be impacting other important species of concern to inform and identify potential adaptive management options for the program.

Draft biological objectives for the RSH program that will be used for evaluation of different hatchery strategies and presentation in HGMPs. PNI=proportionate natural influence, EN= spawning escapement of natural origin fish, K=the minimum number of spawners to produce the asymptotic number of recruits, R=recruitment productivity in recruits per spawner, A=number of adults, H= hatchery, E=spawning escapement (hatchery and natural origin fish combined), N=natural origin recruits, D= donor population, Ne=effective population size, RH=recruitment of hatchery fish, RHN=recruitment of hatchery fish in the natural environment, RN =recruitment of natural origin fish in the natural environment, B = hatchery broodstock, P = pre-spawn mortalities. The fall Chinook salmon hatchery survival standard was to achieve the recent Priest Rapids Hatchery 10-year average survival for the following life stages: collection to spawning for males and females, unfertilized egg-eyed, eyed egg-ponding, 30 days after ponding, 100 days after ponding, ponding to release, and unfertilized egg to release.

1.10) List of program "Performance Indicators", designated by "benefits" and "risks."

Table 1.10.1: "Performance Indicators" addressing benefits.

Benefits		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
3.1.2 Program contributes to mitigation requirements per Flood Control Act of 1950, House Document 531 and *US v. OR*.	This program provides mitigation for lost fish production due to development within the Columbia River Basin and contributes to a meaningful harvest in tribal, sport and commercial fisheries. Achieve a 10-year average of 0.384% total SAR, and the program planning goal for RSH and I-182 of 54,213 total adult production annually.	Survival and contribution to fisheries will be estimated for each brood year released.
3.1.3 Program addresses ESA responsibilities	Program is allowed to continue harvest under ESA Section 7 permits	HGMP updated and re-submitted to NOAA with significant changes or under permit agreement.
3.2.1. Harvest of hatchery-produced fish minimizes impact to wild populations	Harvest is regulated to meet appropriate biological assessment criteria.	Harvests are monitored by agencies to provide up to date information.
3.3.2 Releases are sufficiently marked to allow statistically significant evaluation of program contribution to natural production, and to evaluate effects of the program on the local natural population. See appendix 2	All hatchery origin releases are identifiable as hatchery-origin fish. (adipose-fin clip). A portion will also be CWT'ed.	Annual estimates of mark type of all hatchery releases.
3.4.1 Implement measures for broodstock management to achieve integrated program	Target 30% natural origin fish in broodstock (2,000 NOR if total broodstock = 6,500) are collected throughout the spawning run in proportion to timing, age and sex composition of return.	Adults are collected throughout the spawning run in proportion to timing, age and sex composition of return. Annual run timing, age and sex composition and return timing data are collected.
3.8.3 Non-monetary societal benefits for which the program is designed are achieved.	Provides fish for harest to fulfill cultural and subsistence need for Native American Tribes Contributes to the cultural benefit that fishing provides. Recreational fishery angler days, length of season, number of licenses purchased. Maintain outreach to enhance public understanding,	Annual harvest of hatchery fish based on CWT recovery estimates and creel surveys. Evaluate use and/or exposure of program materials and exhibits as they help support goals of the information and education program. Record on-station organized education and outreach events.

	participation and support of Washington Department of Fish & Wildlife (WDFW) hatchery programs. Provide information about agency programs to internal and external audiences. For example, local schools and special interest groups tour the facility to better understand hatchery operations. Off station efforts may include festivals, classroom participation, stream adoptions and fairs.	

Table 1.10.2: "Performance Indicators" addressing risks.

Risks		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
3.1.3 Program addresses ESA responsibilities	Program will continue to release URB fall Chinook salmon sub-yearlings as authorized by NOAA .	HGMP is updated to reflect any major changes in program and resubmitted to NOAA fisheries.
3.2.1. Harvest of hatchery-produced fish minimizes impact to wild populations	Harvest is regulated to meet appropriate biological assessment criteria.	Harvests are monitored by agencies to provide up-to-date information. Monitor size, number, date of release and mass-mark quality.
3.2.2 Release groups are marked in a manner consistent with information needs and protocols to estimate impacts to natural and hatchery origin fish	All hatchery origin releases are identifiable as hatchery-origin fish. (adipose-fin clip, CWT, otolith-mark, genetic or other), This production will be 100% adipose-fin clipped with a portion being CWT'd.	Annual harvest of hatchery fish based on CWT recovery estimates and creel surveys.
3.4.2 Broodstock collection does not significantly reduce potential juvenile production in natural rearing areas	Number of spawners of natural-origin removed for broodstock	All listed upper CR steelhead (adipose intact; adipose clip only) encountered in Ringold broodstock collection operations will be held for a minimal duration in the traps; generally less than 24 hrs, following permit protocols. All listed steelhead will be immediately released upstream of the hatchery discharge channel in the Columbia River. Upper CR summer/fall chinook are not listed. However, natural-origin recruits taken for Ringold

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		program URB broodstock not to exceed 2,000 adults (pNOB = 0.3) or 5 percent of the natural-origin return to the Hanford Reach, whichever is less.
3.5.1 Patterns of genetic variation within and among natural populations do not change significantly as a result of artificial production	Within and between populations, genetic structure is not affected by artificial production	3.5M program began in 1995, increase to 14.4M (including I-182) in 2018. **See HGMP section 11 for M&E information.**
3.5.3 Artificially-produced adults in natural production areas do not exceed appropriate proportion of the total natural spawning population	The ratio of observed and/or estimated total numbers of artificially-produced fish on natural spawning grounds, to total number of naturally-produced fish (pHOS)	Survival and contribution to fisheries will be estimated for each brood year released. Work with co-managers to manage adult fish returning in excess of broodstock needs.
3.5.4 Juveniles are released on-station or after sufficient acclimation to maximize homing ability to intended return locations	The primary water source during rearing at the Ringold Springs Hatchery a combination of Columbia River water and spring water. Fall Chinook will be reared and imprinted on this unique water source that should increase homing in adult returns. Fish will be transferred from Ringold Springs Hatchery to the I-182 acclimation ponds. Fish will be released into the Yakima River after a 30-120 day acclimation period on Yakima River water. A portion of each release will be CWT and PIT tagged. **See Appendix 2**.	Monitor size, number, date of release and mark quality. Adult returns will be monitored through CWT/PIT recoveries/detections in ocean, in-river, and terminal sites. **See Appendix 2**. Additional WDFW projects: straying, in-stream evaluations of juvenile and adult behaviors, NOR/HOR ratio on the spawning grounds, fish health documented annually Annual release information (type-acclimation, and location-on-station) are recorded annually in hatchery data systems (WDFW Hatchery Headquarters Database).
3.5.5 Juveniles are released at fully-smolted stage.	Hatchery juveniles are raised to smolt-size 50fpp and released from the hatchery at a time that fosters rapid migration downstream. Yearling juveniles would be released at 10fpp.	To maximize smolting characteristics and minimize residualism, WDFW adheres to a combination of acclimation, volitional release strategies, size, and time guidelines. Minimal residualism from WDFW Chinook programs following these guidelines has been indicated from snorkeling studies on the Elochoman River (Fuss 2000).
3.7.1 Artificial production facilities are operated in	Annual reports indicating levels of compliance with applicable	Pathologists from WDFW's Fish Health Section monitor program

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compliance with all applicable fish health guidelines, facility operation standards and protocols including IHOT, Co-managers Fish Health Policy and drug usage mandates from the Federal Food and Drug Administration.	standards and criteria. Periodic audits indicating level of compliance with applicable standards and criteria.	monthly. Exams performed at each life stage may include tests for virus, bacteria, parasites and/or pathological changes, as needed.
3.7.2 Ensure hatchery operations comply with state and federal water quality and quantity standards through proper environmental monitoring.	Discharge water quality for Ringold Springs and I-182 acclimation ponds will be compared to applicable water quality standards by NPDES permit. WDFW water right permit compliance.	Flow and discharge reported in monthly NPDES reports. Monthly discharge water quality reports submitted to Washington Department of Ecology (WDOE). Applicable water quality standards and guidelines will be met, such as those described or required by National Pollution Discharge Elimination System (NPDES) permit WAG-7013 and the PNFHPC.
3.7.3 Water withdrawals and in-stream water diversion structures for hatchery facility will not affect spawning behavior of natural populations or impact juveniles.	Water withdrawals for Ringold Springs Hatchery and the I-182 acclimation ponds compared to NMFS, USFWS and WDFW applicable passage and screening criteria for juveniles and adults.	WDFW hatchery water intake systems minimize impacts to wild salmonids and their habitats based on NOAA Fisheries (NMFS 2011) and approved by USFWS and WDFW for screen mesh size, approach velocity, and sweep velocity criterion. All screens associated with water intakes in surface water areas where fish are present will be modified and maintained to prevent impingement, injury, or mortality to listed salmonids (i.e. Ringold pumped river intake). Ringold Facility: One of the primary water sources for RSRF is gravity-fed spring water which is devoid of all fish life, hence no fish screening required. I-182 Acclimation Site: The intake will consist of a submerged cone screen and pump station designed to meet NOAA Fisheries Guidelines and Criteria (NMFS 2011).
3.7.4 Prevent introduction, spread or amplification of fish pathogens. Follow the *Salmonid Disease Control Policy of the Fisheries Co-Managers of*	Certification of fish health during rearing and immediately prior to release, including pathogens presence and virulence.	WDFW Fish Health Section inspect adult broodstock yearly for pathogens and monitor juvenile fish on a monthly basis to assess health and detect

Washington State (WDFW and WWTIT 1998, updated 2006).		potential disease problems. A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings.
	• Release and/or transfer exams for pathogens and parasites	1 to 6 weeks prior to transfer or release, fish are examined in accordance with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006).
	• Inspection of adult broodstock for pathogens and parasites	At spawning, lots of 60 adult broodstock are examined for pathogens.
	• Inspection of off-station fish/eggs prior to transfer to hatchery for pathogens and parasites	Controls of specific fish pathogens through eggs/fish movements are conducted in accordance to the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006).
3.7.6 Adult broodstock collection operation does not significantly alter spatial and temporal distribution of any naturally-produced population.	Spatial and temporal spawning distribution of natural populations above and below weir/trap currently compared to historic distribution.	Adults are collected throughout the spawning run in proportion to timing, age and sex composition of return. At least 70% of RSH broodstock to be hatchery-origin fish that return to off-river volunteer trap. Natural-origin broodstock (up to 30%; pNOB = 0.3) will be collected from the Hanford Reach by means that do not alter spatial or temporal distribution of the natural-spawning population. Collection methods will include swim-ins, hook and line and the OLAFT trap at Priest Rapids. Alternative fishing gear methods may also be explored.
3.7.8 Predation by hatchery fish does not significantly reduce numbers of natural fish.	Project complies with Section 10 permit conditions including juveniles that are raised to smolt-size (approximately 50 fpp) and released from the hatchery at a time that fosters rapid migration downstream. The yearling production will be raised to 10fpp.	The "33% of body length" criterion for evaluating the potential risk of predation in the natural environment has been used by NOAA Fisheries and the USFWS in a number of biological assessments and opinions (c.f., USFWS 1994; NMFS 2002). WDFW believes that a careful review of the Pearson and Fritts (1999) study

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		supports the continued use of the "33% of body length criterion" until further data for this system can be collected.

1.11) Expected size of program.

Table 1.11.1: Proposed annual fish release levels.

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry		
Sub-Yearling	Ringold Springs Hatchery	10.4M smolts at 50 FPP
Sub-Yearling	I-182 on Yakima River	3.75M smolts at 50 FPP
Yearling	I-182 on Yakima River	500K smolts at 10 FPP

1.11.1) <u>Proposed annual broodstock collection level (maximum number of adult fish)</u>.

- Broodstock are collected at Ringold Springs, I-182 and Priest Rapids Hatchery and the adults needed for this program are approximately 6,500. In order to meet the future smolt, fry, and egg production goals of the Ringold Springs fall Chinook salmon program, the green egg take requirement is 16,300,000.
- Co-managers have agreed to target 70% hatchery origin and 30% natural origin fish broodstock composition.
- Female fecundity averaged around 4,200 eggs/female between 2005-2009.

1.11.2) <u>Proposed annual fish release levels (maximum number) by life stage and location</u>.

Proposed releases are 10.4M smolts at 50 fish per pound (fpp) from Ringold into the Columbia River at Rkm. 567, 3.75M sub-yearling smolts at 50 fpp and 500K yearlings from the I-182 Acclimation Site into the Yakima River at Rkm 7.5 for a total release of 14.65M smolts.

1.12) Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

Table 1.12.1: Total adult URB fall Chinook volunteer returns to Ringold Springs Hatchery.

Year	Returns to RSH		Transfers to CTUIR[a]
	Adults	Jacks	Adults
1997	965	19	**616**
1998	331	51	200
1999	3,076	108	810
2000[b]	15	0	0
2001	1,761	52	950
2002	1,369	31	849
2003	1,021	0	737
2004	824	3	612
2005	2,069	17	0
2006	117	1	0

2007	29	0	0
2008	0	0	0
2009	105	1,410	0
2010	8,946	1,305	0
2011	6,923	1,289	0
2012	5,324	2,067	0
2013	16,437	530	0

[a] Confederated Tribes of the Umatilla Indian Reservation.
[b]Trap failed during 2000.
Data source: WDFW Hatchery Data Unit 2014.

Table 1.12.2: Available smolt to adult survival rates for Ringold Springs Hatchery (RSH).

Brood Year	Release Year	CWTs Released	Adult Catch	Smolt-to-Adult Survival
1997	**1998**	445,242	493	0.11%
1998	**1999**	409,017	1,757	0.43%
1999	**2000**	422,845	849	0.20%
2000	**2001**	399,244	427	0.11%
2001	**2002**	431,370	1,596	0.37%
2002	**2003**	192,931	239	0.12%
2003	**2004**	211,197	60	0.03%
2004	**2005**	222,200	13	0.01%
2005	**2006**	N/a	N/a	N/a
2006	**2007**	222,706	82	0.04%
2007	**2008**	221,951	1,122	0.51%

Data Source: PSMFC RMIS web-site.

See also Tables 2.2.3.1-2.2.3.3 and 3.3.1.1.

Table 1.12.3: Estimated Smolt to Adult Survival (SAS) to Ringold and the I-182 Acclimation Site.

	TAP	Source of Fish
Sub-yearlings	40,088	Ringold Hatchery
Sub-yearlings	7,463	Ringold Hatchery
Yearlings	6,662	Ringold/Bonneville Hatchery

Source: JDM PAC worksheet.

The estimated number of the adults is based on the average (1990-2004) calculation of 0.384% SAS (Ringold Springs) for sub-yearlings. There was no yearling rack return SAS calculation for the I-182 site, so the Umatilla Hatchery rack return SAR of 0.6367% was used for the yearling production as an estimation since it is located fairly close to the I-182 site. Ringold SAS (0.199%) were used for the sub-yearling programs since it is an acclimated sub-yearling release from a rearing facility transfer.

1.13) Date program started (years in operation), or is expected to start.

The first year of current program releases (3.5M smolts) was 1995. The proposed increase to a 14.65M release is set to occur in 2019.

1.14) Expected duration of program.

The program is on-going mitigation for the John Day and The Dalles dams. This program will operate indefinitely.

1.15) Watersheds targeted by program.

Mainstem Columbia River (Hanford Reach) and lower Yakima River for off-station acclimation.

1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

1.16.1 Brief Overview of Key Issues:
Facility upgrades will be required to improve rearing conditions. All the following deficiencies will be corrected during the USACE John Day Mitigation rebuild at Ringold. Current operational and facility difficulties include:

- The river pump diversion is frequently unusable because the intake is completely out of the water or the pump must be removed in case of flooding. WDFW does not currently have a water right permit/certificate for the river diversion (10 cfs application (S3-29444) pending with WA DOE since 4/1/93);
- Avian predation can be extremely high in the 9-acre and 5-acre rearing ponds because no bird predation covers are installed, and are not feasible because of the large dimensions of the two ponds.
- The pond bottom is earthen and should be rebuilt with a sloped concrete bottom to preventing out-migrating smolts from becoming trapped in isolated pools of water.
- All water supplies are located near public roads, with no security, making them vulnerable to vandalism and contamination. This has been a problem in the past, causing flooding to the County road and various rearing areas, fish kills, etc.

1.16.2 Potential Alternatives:

Alternative 1: Increase the facilities capacity to accomplish a 14,439,500 smolt release (10.4M on-site + 4.0M at Yakima R. I-182 Acclimation Site). This will be accomplished by building a "state-of-the-art" facility. This will require major water supply improvements, both in quantity and quality (temperature requirements). This also would require major infrastructure improvements to include, adult trapping and sorting structures, adult holding ponds, incubation facilities, intermediate rearing, and grow-out ponds. The new facility will include the construction of raceways for adult holding and juvenile rearing that should reduce or eliminate the disease and avian predation issues associated with the rearing of juveniles in large earthen ponds. The expansion and modifications to the Ringold Springs facility includes several recommendations to improve the performance of the facility, which will facilitate meeting conservation standards for an integrated hatchery program associated with a natural population with a Primary population designation. With the design of the new Columbia River intake and adult collection facility at Ringold it is likely to recruit natural-origin fish at a higher rate than the current facility. Thus, the rebuild will also further satisfy the 2009 program recommendations of the HSRG, and allow WDFW to obtain integration levels in broodstock consistent with FWC Policy C-3619 (See HGMP Sections 3.1 and 6.2).

1.16.3 Potential Reforms and Investments:

In 2012, the Portland District USACE produced the John Day Mitigation Alternative Study. The purpose of this study is to evaluate alternatives for increasing the number of upriver Bright fall Chinook through the Zone 6 Tribal Fishery (Bonneville to McNary Dams), while minimizing

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effects on Endangered Species Act (ESA) listed Lower Columbia River Chinook. This study has identified several alternatives to the current production activities and each of those alternatives are currently under review.

Alternative 1: Rear and release 10.4M at Ringold with an additional 4.0M intermediate rearing for offsite acclimation at the I-182 Acclimation Site.
Alternative 2: Rear and release 16.7 M at Ringold with an addition 3.5M intermediate rearing for offsite acclimation.

Alternative 3: Rear and release 20.2 M at Ringold with no offsite acclimation.

<u>SECTION 2. PROGRAM EFFECTS ON NMFS ESA-LISTED SALMONID POPULATIONS</u>. (USFWS ESA-Listed Salmonid Species and Non-Salmonid Species are addressed in Addendum A)

2.1) List all ESA permits or authorizations in hand for the hatchery program.

This HGMP will be submitted by the USACE to obtain ESA incidental take prohibition exemption under Section 7 of the ESA.

2.2) Provide descriptions, status, and projected take actions and levels for NMFS ESA-listed natural populations in the target area.

2.2.1) <u>Description of NMFS ESA-listed salmonid population(s) affected by the program</u>.

- Identify the NMFS ESA-listed population(s) that will be <u>directly</u> affected by the program
None.

- Identify the NMFS ESA-listed population(s) that may be <u>incidentally</u> affected by the program.
Upper Columbia River Steelhead (*Oncorhynchus mykiss***)** DPS includes all natural-origin populations of steelhead in the Columbia River basin upstream from the Yakima River, Washington, to the U.S./Canada border. The DPS includes all naturally spawned anadromous O. mykiss (steelhead) populations below natural and man-made impassable barriers in streams in the Columbia River Basin upstream from the Yakima River, Washington, to the U.S.-Canada border, as well six artificial propagation programs: the Wenatchee River, Wells Hatchery (in the Methow and Okanogan Rivers), Winthrop NFH, Omak Creek, and the Ringold steelhead hatchery programs. UCR steelhead were listed as an endangered species on Aug. 18, 1997; status upgraded to threatened on Jan. 5, 2006; reinstated to endangered status per U.S. District Court decision in June 2007; status upgraded to threatened per U.S. District Court order in June 2009. A final designation for critical habitat for UCR steelhead was published on September 2, 2005 (70FR52630).

Middle Columbia River Steelhead (*Oncorhynchus mykiss*) ESU includes steelhead populations in Oregon and Washington drainages upstream of the Hood and Wind River systems, up to and including the Yakima River. The Snake River is not included in this ESU. Major drainages in this ESU are the Deschutes, John Day, Umatilla, Walla Walla, Yakima, and Klickitat river systems. Almost all steelhead populations within this ESU are summer-run fish; the exceptions are winter-run components returning to the Klickitat River and Fifteenmile Creek watersheds. The Middle Columbia River Steelhead DPS includes all naturally spawning populations of steelhead using tributaries upstream and exclusive of the Wind River, Washington, and the Hood River, Oregon, excluding the upper Columbia River tributaries (upstream of Priest Rapids Dam) and the Snake River. The Middle Columbia River Steelhead DPS was listed as threatened by NMFS in 1999, with that designation reaffirmed in 2006. NMFS has defined DPSs of steelhead to include only the anadromous members of this species (70 FR 67130).

Upper Columbia River Spring-run Chinook Salmon (*Oncorhynchus tshawytscha)* ESU includes all natural-origin, stream-type Chinook salmon from river reaches above Rock Island Dam and downstream of Chief Joseph Dam, including the Wenatchee, Entiat, and Methow River basins. The spring-run components of the following hatchery stocks are also listed: Chiwawa, Methow, Twisp, Chewuch, and White rivers and Nason Creek. UCR spring-run Chinook salmon were listed as an endangered species on March 24, 1999; endangered status reaffirmed on June 28, 2005. Critical habitat was designated for UCR spring-run Chinook salmon on December 28, 1993 (58 FR 68543), and a final designation was published on September 2, 2005 (70FR52630).

Snake River Sockeye Salmon (*Oncorhynchus nerka)* ESU includes all anadromous and residual sockeye salmon from the Snake River basin, Idaho, as well as artificially propagated sockeye salmon from the Redfish Lake captive propagation program. This ESU was first listed under the ESA in 1991; the listing was reaffirmed in 2005 (70 FR 37160 and 37204).

Snake River Basin Steelhead (*Oncorhynchus mykiss*) Snake River Steelhead DPS "includes all naturally spawned anadromous steelhead populations below natural and manmade impassable barriers in streams in the Snake River basin of southeast Washington, northeast Oregon, and Idaho as well as six artificial production programs: the Tucannon River, Dworshak NFH, Lolo Creek, North Fork Clearwater River, East Fork Salmon River, and the Little Sheep Creek/Imnaha River Hatchery steelhead hatchery programs (2006 Federal Register 71FR834)." Snake River steelhead are classified as summer run based on their adult run-timing patterns. Much of the freshwater habitat used by Snake River steelhead for spawning and rearing is warmer and drier than that associated with other steelhead DPSs. Snake River steelhead spawning and juvenile rearing occurs across a wide range of freshwater temperature and precipitation regimes. Fisheries managers classify Columbia River summer-run steelhead into two aggregate groups, A-run and B-run, based on ocean age at return, adult size at return, and migration timing. A-run steelhead predominately spend 1 year at sea and are assumed to be associated with low- to mid-elevation streams throughout the interior Columbia basin. B-run steelhead are larger with most individuals, returning after 2 years in the ocean. B-run steelhead are believed to be more prevalent in higher elevation drainages. NMFS has defined DPSs of steelhead to include only the anadromous members of the species (70 FR 67130). The listing was reaffirmed August 15, 2011 (76 FR 50448).

Snake River Spring/summer-run Chinook Salmon (*Oncorhynchus tshawytscha)* ESU includes all naturally spawned populations of spring/summer-run Chinook salmon in the mainstem Snake River and Tucannon, Grande Ronde, Imnaha, and Salmon River subbasisns, as well as 15 artificial propagation programs. The ESU was first listed under the ESA in 1992 and the listing was reaffirmed in 2005. (Ford 2011).

Snake River Fall-run Chinook Salmon (*Oncorhynchus tshawytscha)* ESU includes fish spawning in the lower mainstem of the Snake River and the lower reaches of several of the associated major tributaries including the Tucannon, Grande Ronde, Clearwater, Salmon, and Imnaha rivers. This ESU was originally listed under the ESA in 1992 (reaffirmed in 2005, FR 70FR37160). Historically, this ESU included two large additional populations spawning in the mainstem of the Snake River upstream of the Hells Canyon Dam complex.

2.2.2) Status of NMFS ESA-listed salmonid population(s) affected by the program.

- Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds *(see definitions in "Attachment 1").*

Upper Columbia River Steelhead (*Oncorhynchus mykiss*) Status Update:
Upper Columbia River steelhead populations have increased in natural-origin abundance in recent years, but productivity levels remain low. The proportions of hatchery-origin returns in natural spawning areas remain extremely high across the DPS, especially in the Methow and Okanogan river populations. The modest improvements in natural returns in recent years are probably primarily the result of several years of relatively good natural survival in the ocean and tributary habitats. Tributary habitat actions called for in the Upper Columbia Salmon Recovery Plan are anticipated to be implemented in the next 25 years and the benefits of some of those actions will require some time to be realized. Overall, the new information considered does not indicate a change in the biological risk category since the time of the last BRT status review (Ford 2011).

Middle Columbia River Steelhead DPS (*Oncorhynchus mykiss*) Status Update:
The BRT noted that this particular DPS was difficult to score. Reasons cited included the wide range in relative abundance for individual populations across the DPS (e.g., spawning abundance in the John Day and Deschutes basins has been relatively high, while returns to much of the Yakima River drainage have remained relatively low), chronically high levels of hatchery strays into the Deschutes River, and a lack of consistent information on annual spawning escapements in some tributaries (e.g., Klickitat River). Resident *O. mykiss* are believed to be very common throughout this DPS. The BRT assumed that the presence of resident *O. mykiss* below anadromous barriers mitigated extinction risk to the DPS to some extent, but the majority of BRT members concluded that significant threats to the anadromous component remained (Ford 2011).

There have been improvements in the viability ratings for some of the component populations, but the Middle Columbia River Steelhead DPS is not currently meeting the viability criteria (adopted from the ICTRT) in the Mid-Columbia Steelhead Recovery Plan. In addition, several of the factors cited by the 2005 BRT (Good et al. 2005) remain as concerns or key uncertainties. Natural-origin spawning estimates are highly variable relative to minimum abundance thresholds across the populations in the DPS. Updated information indicates that stray levels into at least the lower John Day River population are also high. Returns to the Yakima River basin and to the Umatilla and Walla Walla rivers have been higher over the most recent brood cycle while natural-origin returns to the John Day River have decreased. Out-of-basin hatchery stray proportions, although reduced, remain very high in the Deschutes River basin. Overall the new information considered does not indicate a change in the biological risk category since the time of the last BRT status review (Ford 2011).

Upper Columbia River Spring-Run Chinook Salmon (*Oncorhynchus tshawytscha)* Status Update: The Upper Columbia Spring-run Chinook Salmon ESU is not currently meeting viability criteria (adapted from the ICTRT) in the Upper Columbia Salmon Recovery Plan. Increases in natural-origin abundance relative to the extremely low spawning levels observed in the mid-1990s are encouraging; however, average productivity levels remain extremely low. Large-scale directed supplementation programs are underway in two of the three extant populations in the ESU. These programs are intended to mitigate short-term demographic risks while actions to improve natural productivity and capacity are implemented. While these programs may provide short-term demographic benefits, there are significant uncertainties regarding the long-term risks of relying on high levels of hatchery influence to maintain natural populations (Ford 2011).

Snake River Sockeye Salmon (*Oncorhynchus nerka)* Status Update: Substantial progress has been made with the Snake River sockeye salmon captive broodstock–based hatchery program, but natural production levels of anadromous returns remain extremely low for this ESU. In recent years, sufficient numbers of eggs, juveniles, and returning hatchery adults have been available from the captive brood–based program to allow for initiation of efforts to evaluate alternative supplementation strategies in support of reestablishing natural production of anadromous sockeye. Limnological studies and direct experimental releases are being conducted to elucidate production potential in three of the Stanley Basin lakes that are candidates for sockeye restoration. The availability of increased numbers of adults and juveniles in recent years is supporting direct evaluation of lake habitat rearing potential, juvenile downstream passage survivals, and adult upstream survivals. Although the captive brood program has been successful in providing substantial numbers of hatchery-produced sockeye salmon for use in supplementation efforts, substantial increases in survival rates across life history stages must occur in order to reestablish sustainable natural production (e.g., Hebdon et al. 2004, Keefer et al. 2008). The increased abundance of hatchery-reared Snake River sockeye reduces the risk of immediate loss, but levels of naturally produced sockeye returns remain extremely low. As a result overall, although the risk status of the Snake River Sockeye Salmon ESU appears to be on an improving trend, the new information considered does not indicate a change in the biological risk category since the time of the last BRT status review (Ford 2011).

Snake River Basin Steelhead (*Oncorhynchus mykiss*) Status Update: The level of natural production in the two populations with full data series and the Asotin Creek index reaches is encouraging, but the status of most populations in this DPS remains highly uncertain. Population-level natural-origin abundance and productivity inferred from aggregate data and juvenile indices indicate that many populations are likely below the minimum combinations defined by the ICTRT viability criteria. A great deal of uncertainty remains regarding the relative proportion of hatchery fish in natural spawning areas near major hatchery release sites. There is little evidence for substantial change in ESU viability relative to the previous BRT and ICTRT reviews. Overall, therefore, the new information considered does not indicate a change in the biological risk category since the time of the last BRT status review (Ford 2011).

Snake River Spring/summer-run Chinook Salmon (*Oncorhynchus tshawytscha)* Status Update: Population-level status ratings remain at high risk across all MPGs within the ESU; although recent natural spawning abundance estimates have increased, all populations remain below minimum natural-origin abundance thresholds. Relatively low natural production rates and spawning levels below minimum abundance thresholds remain a major concern across the ESU. The ability of populations to be self-sustaining through normal periods of relatively low ocean survival remains uncertain. Factors cited by the 2005 BRT (Good et al. 2005) remain as concerns or key uncertainties for several populations. Overall, the new information considered does not indicate a change in the biological risk category since the time of the last BRT status review (Ford 2011).

Snake River Fall Chinook Salmon Current Status Per ICTRT Viability Criteria:
The overall viability ratings for all populations in the Snake River Spring/Summer-run Chinook Salmon ESU remain at high risk after the addition of more recent year abundance and productivity data. Under the approach recommended by the ICTRT, the overall rating for an ESU depends upon population-level ratings organized by MPG within that ESU. The following brief summaries describe the current status of populations within each of the extant MPGs in the ESU, contrasting the current ratings with assessments previously done by the ICTRT using data through the 2003 return year (Ford 2011).

Snake River Fall-run Chinook Salmon (*Oncorhynchus tshawytscha)* Status Update: A/P estimates for the single remaining population of Snake River fall-run Chinook salmon have improved substantially relative to the time of listing. However, the current combined estimates of abundance and productivity population still result in a moderate risk of extinction of between 5%

and 25% in 100 years. The extant population of Snake River fall Chinook is the only one remaining from a historical ESU that also included large mainstem populations upstream of the current location of Hells Canyon Dam complex. The recent increases in natural-origin abundances are encouraging; however, hatchery-origin spawner proportions have increased dramatically in recent years. On average, 78% of the estimated adult spawners have been hatchery-origin over the most recent brood cycle. Overall, the new information considered does not indicate a change in the biological risk category since the time of the last BRT status review. (Ford 2011).

- Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.

Upper Columbia River Steelhead (*Oncorhynchus mykiss*)
See tables from Ford 2011 below.

Middle Columbia River Steelhead (*Oncorhynchus mykiss*)
See tables from Ford 2011 below.

Upper Columbia River Spring-run Chinook Salmon (*Oncorhynchus tshawytscha)*
See tables from Ford 2011 below.

Snake River Sockeye Salmon (*Oncorhynchus nerka)*
See tables from Ford 2011 below.

Snake River Basin Steelhead (*Oncorhynchus mykiss*)
See tables from Ford 2011 below.

Snake River Spring/summer-run Chinook Salmon (*Oncorhynchus tshawytscha)*
See tables from Ford 2011 below.

Snake River Fall-run Chinook Salmon (*Oncorhynchus tshawytscha)*
See tables from Ford 2011 below.

- Provide the most recent 12 year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data

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Upper Columbia River Steelhead (*Oncorhynchus mykiss*)

Table 2.2.2.1: Long-term trends in natural-origin spawning abundance for upper Columbia River steelhead populations

Population	Years	Trend in total spawners	Lambda (HF = 0)		Lambda (HF = 1)	
		Estimate (CI)	Estimate (CI)	*P* > 1	Estimate (CI)	*P* > 1
Wenatchee River	1978–2009	1.05 (1.02–1.07)	1.07 (0.87–1.32)	0.78	0.80 (0.67–0.98)	0.02
Entiat River	1978–2009	1.04 (1.02–1.07)	1.05 (0.86–1.27)	0.71	0.79 (0.67–0.93)	0.007
Methow River	1977–2009	1.08 (1.05–1.12)	1.08 (0.89–1.32)	0.82	0.67 (0.59–0.77)	0.000 3
Okanogan River	1977–2009	1.03 (1.01–1.05)	1.03 (0.86–1.23)	0.66	0.56 (0.49–0.65)	00.00 01

Data Source: Ford 2011.

Table 2.2.2.2: Recent abundance and proportion of natural-origin steelhead in natural spawning areas compared to estimates at the time of listing and in the previous BRT review. Abundance estimates (5-year geometric mean with range in parentheses) correspond to the time of listing and the 2005 BRT review.

Populaton North Cascades MPG	Total spawners (5-year geometric mean, range)			Natural origin (5-year geometric mean)			Percent natural origin (5-year average)		
	Listing (1991–1995)	Prior (1997–2001)	Current (2005–2009)	Listing (1991–1995)	Prior (1997–2001)	Current (2005–2009)	Listing (1991–1995)	Prior (1997–2001)	Current (2005–2009)
Wenatchee River	1,880	696 (343–1,655)	1,891 (931–3,608)	458	326 (241–696)	819 (701–962)	24	48	47
Entiat River	121	265 (132–427)	530 (300–892)	59	46 (31–97)	116 (99–137)	48	19	23
Methow River	1,184	1,935 (1,417–3,325)	3,504 (2,982–4,394)	251	162 (68–332)	505 (361–703)	21	9	15
Okanogan River	723	1,124 (770–1,956)	1,832 (1,483–2,260)	84	53 (22–109)	152 (104–197)	12	5	9
Aggregate count at Priest Rapids Dam	8,420	14,592	16,989	1,147	3,007	3,604	14	19	19

Data Source: Ford 2011.

Middle Columbia River Steelhead (*Oncorhynchus mykiss*)

Table 2.2.2.3: Summary of abundance and hatchery proportions in natural spawning areas for mid-Columbia steelhead populations organized by MPG. Estimates for brood cycle prior listing (1992 -1996) and the 2005 BRT review included for comparison. Estimates for all series calculated using current data sets

Population (organized by MPG)	Total spawners (5-year geometric mean, range)			Natural origin (5-year geometric mean)			Percent natural origin (5-year average)		
	Listing (1992–1996)	Prior (1997–2001)	Current (2005–2009)	Listing (1992–1996)	Prior (1997–2001)	Current (2005–2009)	Listing (1992–1996)	Prior (1997–2001)	Current (2005–2009)
East Side Cascades MPG									
Fifteenmile Cr.	396	571 (234–974)	452 (225–1,956)	396	571 (234–974)	452 (225–1,956)	100	100	100
East side Deschutes	651	3,114 (1,829–10,005)	2,457 (1,720–4,151)	421	1,753 (475–8,637)	1,945 (1,600–2,395)	65	62	80
West side Deschutes	248	594 (417–920)	574 (408–780)	175	415 (290–766)	472 (314–567)	71	70	82
John Day MPG									
Upper mainstem	601	699 (333–1,771)	500 (166–980)	578	651 (326–1,593)	459 (149–910)	96	93	92
North Fork	1,242	2,134 (1,021–4,539)	1,618 (789–4,072)	1,196	1,988 (978–4,083)	1,484 (707–3,878)	96	93	92
Middle Fork	926	1,169 (477–3,478)	400 (238–770)	891	1,089 (457–3,129)	367 (213–707)	96	93	92
South Fork	302	293 (105–1,094)	434 (232–662)	290	273 (103–984)	398 (207–6,302)	96	93	92
Lower mainstem	1,001	2,139 (625–6,096)	1,382 (749–4,324)	964	2,013 (625–5,553)	1,006 (508–3,480)	96	94	73
Yakima MPG									
Satus Creek	347	365 (310–413)	831 (524–1,129)	317	337 (269–398)	809 (519–1,121)	91	92	97
Toppenish Creek	131	345 (156–1,229)	482 (265–820)	119	318 (132–1,208)	469 (262–802)	91	92	97
Naches River	278	471 (346–1,000)	848 (496–1,199)	254	435 (304–983)	825 (491–1,190)	91	92	97
Upper Yakima	53	66 (42–171)	158 (80–226)	51	65 (42–162)	156 (80–223)	91	99	99
Umatilla/Walla Walla MPG									
Umatilla River	1,549	2,163 (1,527–3,360)	2,893 (1,654–4,667)	1,118	1,288 (769–2,451)	2,273 (1,373–3,625)	72	61	79
Touchet River	511	382 (286–559)	497 (385–626)	449	345 (252–493)	347 (277–438)	88	90	70
Walla Walla River	772	631 (421–1,172)	838 (472–1,658)	765	618 (419–1,118)	815 (464–1,623)	99	98	97

Data Source: Ford 2011.

Upper Columbia River Spring-Run Chinook Salmon (*Oncorhynchus tshawytscha)*

Table 2.2.2.4: Comparison of current trends to prior review of short-term trends in natural-origin spawners, upper Columbia River spring Chinook salmon.

Population		1998 BRT (1987–97)	Previous (1990–2001)	Current (1995–2008)
Wenatchee River	Estimate	0.86	1.05	1.11
	CI	0.81–0.92	1.02–1.07	1.04–1.17
	$P > 1.0$	0.0002	0.99	0.99
Entiat River	Estimate	0.86	1.04	1.11
	CI	0.80–0.91	1.02–1.07	1.05–1.17
	$P > 1.0$	0.0001	0.99	0.99
Methow River	Estimate	0.91	1.08	1.17
	CI	0.80–1.03	1.05–1.12	1.11–1.24
	$P > 1.0$	0.05	1.00	1.00
Okanogan River	Estimate	0.90	1.03	1.16
	CI	0.79–1.02	1.01–1.05	1.10–1.22
	$P > 1.0$	0.04	0.99	1.00

Data Source: Ford 2011.

Snake River Sockeye Salmon (*Oncorhynchus nerka)*

Table 2.2.2.5: Adult sockeye salmon returns to Stanley Basin weir sites.

Year	Redfish Lake Creek			Sawtooth FH	Stanley Basin
	Below weir	Weir	Subtotal	weir count	total
1987	—	16	16	—	16
1988	—	1	1	—	1
1989	—	1	1	—	1
1990	—	0	0	—	0
1991	—	4	4	—	4
1992	—	1	1	—	1
1993	—	8	8	—	8
1994	—	1	1	—	1
1995	—	0	0	—	0
1996	—	1	1	—	1
1997	—	0	0	—	0
1998	—	1	1	—	1
1999	—	7	7	—	7
2000	—	257	257	—	257
2001	—	26	26	—	26
2002	—	22	22	—	22
2003	—	3	3	—	3
2004	—	27	27	—	27
2005	—	6	6	—	6
2006	—	3	3	—	3
2007	—	7	7	3	10
2008	52	380	432	218	650
2009	—	563	563	246	809

Note: In 2008 50 adult fish were counted in Redfish Lake Creek below the weir site, an additional 2 fish passed the weir site outside of the counting period. Data Source: Ford 2011.

Snake River Basin Steelhead (*Oncorhynchus mykiss*)

Table 2.2.2.6: Current status ratings using ICTRT viability criteria for Snake River steelhead populations grouped by MPG. Natural spawning abundance: most recent 10-year geometric mean (range). ICTRT productivity: ICTRT productivity: 20-year geometric mean for parent escapements below 75% of population threshold (90% confidence limits).

	Abundance and productivity metrics				Spatial structure and diversity metrics			
Population	**ICTRT minimum threshold**	**Natural spawning abundance**	**ICTRT productivity**	**Integrated A/P risk**	**Natural processes risk**	**Diversity risk**	**Integrated SS/D risk**	**Overall viability rating**
Tucannon River	1,000	Insufficient data	Insufficient data	High?*	Low	Moderate	Moderate	High risk?*
Asotin Creek	500	Insufficient data	Insufficient data	Maintained	Low	Moderate	Moderate	Maintained? High risk?
Lower Grande Ronde River	1,000	Insufficient data	Insufficient data		Low	Moderate	Moderate	Maintained?
Joseph Creek	500			Very low	Very low	Low	Low	Highly viable
2000–2009		2,186 (1,212–4,751)	2.25 (1.61–3.16					
1995–2004		1,878 (573–4,751)	2.63 (2.01–3.46)					
Up. Grande Ronde	1,500			Viable (moderate)	Very low	Moderate	High	Maintained
2000–2009		1,340 (673–1,943)	2.88 (1.09–7.65					
1995–2004		1,240 (673–2,277)	2.70 (1.65–4.41)					
Wallowa River	1,000	Insufficient data		High?	Very low	Low	Low	High risk?
Imnaha River	1,000	Insufficient data	Insufficient data	Moderate?	Very low	Moderate	Moderate	Maintained?
Lower main. Clearwater River	1,500	Insufficient data	Insufficient data	Moderate?	Very low	Low	Low	Maintained?
South Fork Clearwater River	1,000	Insufficient data	Insufficient data	High	Low	Moderate	Moderate	High risk?
Lolo Creek	500	Insufficient data	Insufficient data	High	Low	Moderate	Moderate	High risk?
Selway River	1,000	Insufficient data	Insufficient data	High	Very low	Low	Low	High risk?
Lochsa River	1,000	Insufficient data	Insufficient data	High	Very low	Low	Low	High risk?
Little Salmon Riv.	500	Insufficient data	Insufficient data	Moderate	Low	Moderate	Moderate	Maintained?
South Fork Salmon River	1,000	Insufficient data	Insufficient data	High	Very low	Low	Low	High risk?
Secesh River	500	Insufficient data	Insufficient data	High	Low	Low	Low	High risk?
Chamberlain Creek	500	Insufficient data	Insufficient data	High	Low	Low	Low	High risk?
Lower Middle Fork Salmon Riv.	1,000	Insufficient data	Insufficient data	High	Very low	Low	Low	High risk?
Upper Middle Fork Salmon Riv.	1,000	Insufficient data	Insufficient data	High	Very low	Low	Low	High risk?
Panther Creek	500	Insufficient data	Insufficient data	Moderate	High	Moderate	High	High risk?
North Fork Salmon River	500	Insufficient data	Insufficient data	Moderate	Low	Moderate	Moderate	Maintained?
Lemhi River	1,000	Insufficient data	Insufficient data	Moderate	Low	Moderate	Moderate	Maintained?
Pahsimeroi River	1,000	Insufficient data	Insufficient data	Moderate	Moderate	Moderate	Moderate	Maintained?
East Fork Salmon River	1,000	Insufficient data	Insufficient data	Moderate	Very low	Moderate	Moderate	Maintained?
Upper mainstem Salmon River	1,000	Insufficient data	Insufficient data	Moderate	Very low	Moderate	Moderate	Maintained?

*Question mark (?) = uncertain due to lack of data, only a few years of data, or large gaps in the data series.

Data Source: Ford 2011.

Snake River Spring/summer-run Chinook Salmon (*Oncorhynchus tshawytscha)*

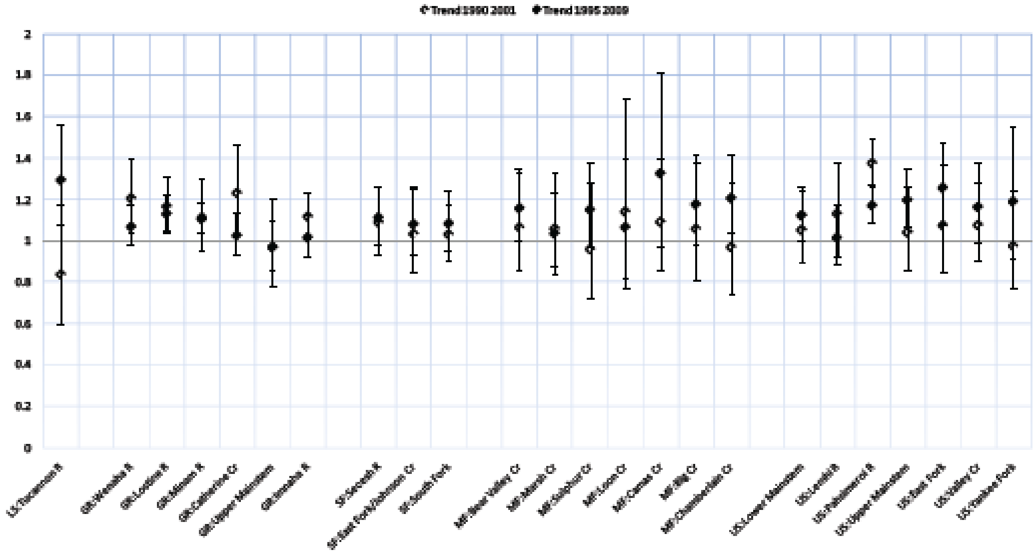

Figure 2.2.2.1: Short-term trend in natural-origin spawning abundance exp (slope of ln(natural-origin spawners) vs. year) for Snake River Spring/Summer-run Chinook. Salmon populations. Solid diamond/bar is point estimate and 95% cf for 1995-2009. Open diamond/bar is equivalent statistics for prior review. Source: Ford 2011.

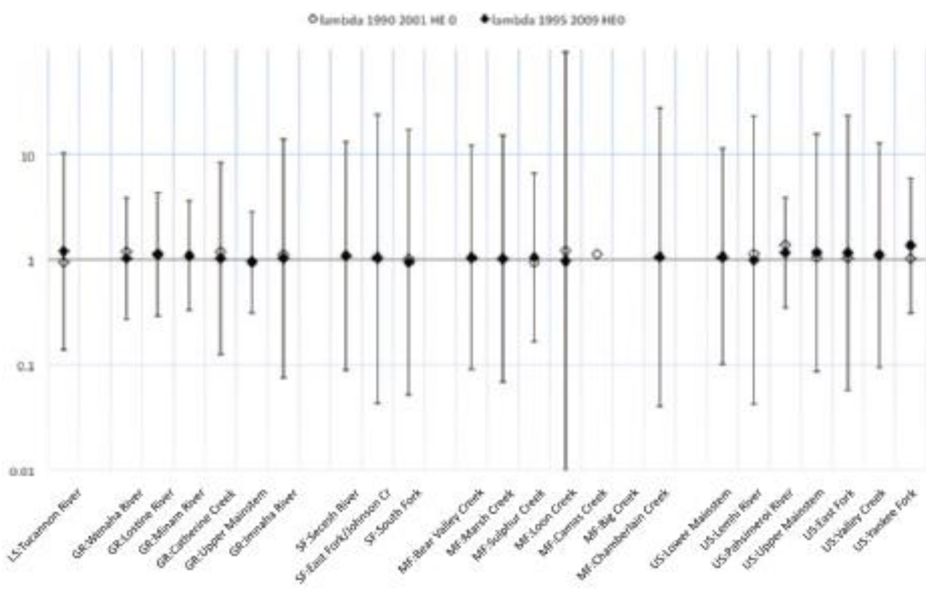

Figure 2.2.2.2: Short-term population growth rate (lambda) estimates for Snake River Spring/Summer-run Chinook salmon populations. Relative hatchery effectiveness set to 0.0. Solid diamond/bar is point estimate and 95% cf for 1995-2009. Open diamond/bar is equivalent statistics for prior review. Source: Ford 2011.

Snake River Fall-Run Chinook Salmon (*Oncorhynchus tshawytscha)*

Table 2.2.2.7: Recent abundance and proportion of natural-origin Snake River fall-run Chinook salmon in natural spawning areas compared to estimates at the time of listing and the previous BRT review.

Total spawners (5-year geometric mean, range)		Natural origin (5-year geometric mean)		Percent natural origin (5-year average)	
Prior (1997–2001)	Current (2003–2008)	Prior (1997–2001)	Current (2003–2008)	Prior (1997–2001)	Current (2003–2008)
2,164 (962–9,875)	11,321 (7,784–17,266)	1,055 (306–5,163)	2,291 (1,762–2,983)	51	22

Data Source: Ford 2011.

Table 2.2.2.8: Short-term trends in natural-origin spawning abundance (slope of natural ln adult spawners) for the lower Snake fall-run Chinook salmon population. Comparisons with time periods corresponding to prior BRT reviews included.

	Short-term trend		
	1998 BRT (1987–97)	Previous (1990–2001)	Current (1995–2008)
Estimate	1.12	1.23	1.16
CI	0.996–1.26	1.09–1.40	1.06–1.27
$P > 1.0$	0.97	0.998	0.998

Data Source: Ford 2011.

- Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

Upper Columbia River Steelhead (*Oncorhynchus mykiss*)

Steelhead production in the Hanford Reach is poorly documented and much of what is conjectured is based on anecdotal or circumstantial evidence. Direct observation and enumeration of steelhead spawning is difficult due to river conditions in spring. In 1968 and 1970, researchers observed 150 redds during limited surveys (T. Eldred, WDW, pers. comm.). See **Tables 2.2.2.1-2.2.2.2** above.

Middle Columbia River Steelhead (*Oncorhynchus mykiss*)
See **Table 2.2.2.3** above.

Upper Columbia River Spring-Run Chinook Salmon (*Oncorhynchus tshawytscha*)

Table 2.2.2.9: Estimated spawning abundance in natural spawning areas for upper Columbia River spring-run Chinook salmon populations.

	Total spawners (5-year geometric mean, range)			Natural origin (5-year geometric mean)			Percent natural origin (5-year average)		
Population	Listing (1991–1996)	Prior (1997–2001)	Current (2004–2008)	Listing (1991–1996)	Prior (1997–2001)	Current (2004–2008)	Listing (1991–1996)	Prior (1997–2001)	Current (2004–2008)
Wenatchee River	167	463 (133–2,957)	1,336 (595–2,104)	NA	274	489	69	60	31
Entiat River	89	111 (53–444)	261 (224–325)	NA	61	112	82	62	46
Methow River	325	465 (443–11,144)	1,343 (1,002–1,801)	NA	248	402	78	45	29

Data Source: Ford 2011.

Snake River Sockeye Salmon (*Oncorhynchus nerka)*
See Table 2.2.2.5 above.

Snake River Basin Steelhead (*Oncorhynchus mykiss*)
See Table 2.2.2.6 above.

Snake River Spring/summer-run Chinook Salmon (*Oncorhynchus tshawytscha)*
Proportions of natural and hatchery-origin are not available as separate measures. They are reported in Ford (2011) as natural-origin and total spawners. See Ford 2011 pages 76-79, Figures 35-39.

Snake River Fall-Run Chinook Salmon (*Oncorhynchus tshawytscha)*
See **Tables 2.2.2.7 - 2.2.2.8** above.

2.2.3) Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of NMFS listed fish in the target area, and provide estimated annual levels of take

- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.
The following activities are identified in the ESA Section 7 Consultation "Biological Opinion on Artificial Propagation in the Columbia River Basin" (March 29, 1999). Incidental take are submitted in take tables at the end of this HGMP.

Broodstock & Trapping Operations: Ringold Facility: The hatchery channel trap is used to collect fall Chinook salmon broodstock "volunteers" between first week in September and first week in December. Numbers of trapped listed species observed are low with the current facility. These include UCR natural-origin and hatchery steelhead, and possibly, Snake River steelhead or fall chinook. In 2011there were 3 wild steelhead encountered in the Ringold trap during fall Chinook salmon collection. In 2010 there were 5 wild steelhead encountered in the trap. These are removed and returned unharmed to the Columbia River. No known mortality occurred from handling these fish. No listed UCR spring Chinook will be affected during fall Chinook trapping because run timing does not overlap. Minimal numbers, if any, are likely to be falsely attracted to the Ringold discharge channel during spring rearing of the fall Chinook smolts. No take of spring Chinook is anticipated. A low number of Snake River fall Chinook strays have been detected at Ringold (10 tags total detected). In the Umatilla Basin only four Snake River fall Chinook have been detected since 2001 from 100% mark groups of 200K and 300K size releases. **For more information see HGMP Sections 5 and 7.2.**

I-182 Acclimation Site: A fish ladder will be located on the right bank of the Yakima River. The adult fish returning to the I-182 facility would be collected for brood or surplused; the dual use ponds will be used for short-term holding. **For more information see HGMP Sections 5 and 7.2**.

Genetic introgression: Returning fall Chinook may contribute to spawning in the Hanford Reach but stocks are not listed and hatchery origin fish are derived from the Hanford Reach population. Contribution of Ringold Hatchery fish spawning in Hanford Reach averaged 1.44 percent between 2004 and 2013. Impact on listed spring Chinook and steelhead stocks located upriver in the UCR major tributaries above and below Rocky Reach Dam (RM 397.1) is unlikely due to stock and habitat characteristics (Peven 2003).

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Rearing Program:

Operation of Hatchery Facilities: With the build out of the current facility funded by the USACE. Fish will be acclimated and reared in a combination of raceways and dual use ponds. Water will be pumped from the Columbia River and mixed with the current spring water supply to provide a distinct acclimation water source. The intake is designed to pump 90 cfs and will meet NMFS intake criteria. Additionally, the existing spring water supply for the facility does not contain listed or unlisted fish. Effluent during a cleaning event will be treated using an abatement pond. All flow and operations are maintained within permitted discharge guidelines. Ringold Springs adheres to The Clean Water Act Section 402 NPDES Permit requirements specific for each facility. This permit sets forth allowable discharge levels and hatchery practices necessary to protect the environment. **See HGMP Sections 4.1 and 4.2**. Indirect take from this operation is unknown.

<u>I-182 Acclimation Site:</u> Pollution abatement facilities would be required to meet NPDES requirements for drain water released to the Yakima River. A two cell settling pond designed to the latest technology standards would be designed to meet the water quality standards. The rearing ponds would be cleaned using a vacuum system. **See HGMP Sections 4.1 and 4.2**.

Disease: To address concerns of potential disease transmission from hatchery to natural fish, the Pacific Northwest Fish Health Protection Committee (PNFHPC) has established guidelines to ensure hatchery fish are released in good condition, thus minimizing impacts on natural fish (PNFHPC). Over the years, rearing densities, disease prevention and fish health monitoring have greatly improved the health of the programs at Wells, Klickitat and Ringold Springs Hatcheries. Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1995) Chapter 5 have been instrumental in reducing disease outbreaks. Indirect take from disease is unknown.

Release:

Hatchery Production/Density-Dependent Effects: Currently up to 10.8 million URB fall Chinook smolts are released annually in the Hanford Reach (HR), 7.3M at Priest Rapids Hatchery (PRH) + 3.5M at RSRF. Of the 10.8M total, 5.2M (48%) are USACE-funded John Day Mitigation (JDM) fish. This proposal seeks to increase annual production to 14.65M smolts, of which 10.4M would be released on-station, thereby increasing the HR total release to 16.0M. The remaining 4.25M RSH production would be released in the lower Yakima R. at the I-182 acclimation site, bringing the total URB release above McNary Dam to 20.25M. The production at I-182 can be a combination of yearling and sub-yearling releases to achieve the TAP of 14,125. The current Prosser 1.7M is included in the potential 4.25M released into the Yakima River. The JDM release above McNary would be 14.25M (70.4% of the total release). Other programs, comparable in size and larger (numbers and pounds) operate in the Columbia River system (e.g. Releases from Spring Creek NFH prior to 2009 were approx. 15 million smolts into the Columbia system, current program release is 10.5M). Listed steelhead and spring Chinook spawning and rearing habitat occurs in major and minor tributaries in the Upper Columbia Region (UCR) upriver of the release site. Fish produced in these areas would migrate past the hatchery location from spring to late summer. In the area below Bonneville Dam, LCR listed smolts will be co-mingled and would be migrating over the same timeline along with up-river stocks. Migration rates in the Columbia mainstem are believed to be rapid (Bumgarner et al, 2000) with most smolts moving through the system quickly. Impacts on ESA-listed fish are unknown (See also *Competition* below).

Competition: Will monitor the migration rates with the use of PIT tags, see task 10 in attached draft monitoring and evaluation plan. Studies conducted in other areas indicate this program is likely to pose a minimal risk of competition due to the migration speed that smolted fish can travel, especially once in the Columbia mainstem. PIT tagging studies (Bumgarner et al, 2000) have indicated that URB releases from Ringold Springs moved past McNary Dam within the first

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two weeks (mean travel days - 14) after volitional release, with some of these fish reaching Bonneville Dam (320 RKm downstream) in two weeks. In the Columbia River, studies indicate that fish appear to travel quickly. Median travel time of sub-yearling Chinook on the mainstem Columbia River, from McNary to Bonneville Dam, was estimated to average 8.0 days (29.2 RKm/d) during the years 1997 to 2003 (Memo- Michele DeHart to Bill Tweit (WDFW), 2003). In a study designed to define the migrational characteristics of Chinook salmon, coho salmon, and steelhead trout in the Columbia River estuary, Dawley et al (1984), found the average migration rates for sub-yearling Chinook, yearling Chinook, and coho salmon and steelhead, were 22, 18, 17, and 35 RKm/d respectively.

Predation Risk Factors:

Environmental Characteristics: During the juvenile fish migration season from late March until mid-summer, flows in the river increase during spring run-off and are augmented from increased water spilled over several dams to aid juvenile migration. Below Priest Rapids Dam, the main Columbia increases from 80,000 cfs to 104,000 cfs during April, 192,000 during May and peaks in June at 266,000 cfs (USGS real time data averages 1929 – 2002).

Dates of Releases: Releases from Ringold Hatchery for the past five years have occurred in late-June to early-July. This is generally after listed steelhead and spring Chinook smolts from the UCR region have past. Steelhead smolts originating above McNary Dam and representing upper Columbia and Snake river origin populations exhibit average peak passage at McNary Dam from May 7 through May 26 (1984- 86 observations reported in Fish Passage Center (FPC) 1987). For more information see **Section 10 – Releases**.

Relative Body Size: Salmonid predators were thought to be able to prey on fish up to approximately 1/3 of their length (USFWS 1994), although coho salmon have been observed to consume juvenile Chinook salmon of up to 46% of their total length in aquarium environments (Pearsons and Fritts 1999). The “33% of body length” criterion for evaluating the potential risk of predation in the natural environment has been used by NOAA Fisheries and the USFWS in a number of biological assessments and opinions (c.f., USFWS 1994; NMFS 2002). WDFW believes that a careful review of the Pearson and Fritts (1999) study supports the continued use of the “33% of body length criterion” until further data for this system can be collected.

Release Location and Release Type: <u>Ringold Facility:</u> Fish are currently released from two large acclimation ponds directly into Spring Creek 0.125 Rm from the Columbia mainstem. Fish are released volitionally as the ponds are slowly drained over several days. Fish are normally acclimated for 30-45 days total at this site prior to release. In the plans for the new hatchery rebuild, there will be rearing ponds and raceways which will release the fish directly into Spring Creek. A similar acclimation/volitional release strategy will be utilized at the <u>I-182 Acclimation Site</u>. **See HGMP Section 10 - Releases.**

Potential Ringold Springs URB predation and competition effects on listed salmonids: This proposal seeks to increase fish production to14.4M smolts for annual releases from Ringold Springs Hatchery and the I-182 Acclimation Ponds. These juvenile releases will be primarily comprised of zero age fall Chinook (sub-yearling) at 50 fish per pound, approximately 97mm in length with a smaller component of yearling fall Chinook released from the I-182production at 10 fish per pound, approximately 130mm in length. As smolts, they are less likely to compete for food or habitat with listed stocks emigrating downriver from the Upper Columbia Region (UCR) as studies suggest rapid movement once in the mainstem (see *Competition*). Listed UCR-origin steelhead smolts out-migrating downstream past Rock Island Dam average 160-180 mm fork length (Peven and Fielder 1988; 1989; 1990) and exceed the size of URB Chinook from this program. Listed UCR Chinook fish emerge at a size of 39 - 41 mm fl, and exceed the 33% predator-prey threshold. Releases in mid-June would place program fish within the same time window as Lower Columbia Chinook (March – August, LCFRB Basin Plans 2004). However, fish in the mainstem would have a high potential to migrate rapidly through the corridor.

Chinook Migration Timing: PIT tags will be used to monitor out-migration timing of fish released from Ringold, see task 10 in attached draft monitoring and evaluation plan. Once in the mainstem corridor, in 1983, peak migration of juvenile salmonids entering the Columbia River Estuary at Jones Beach (Rkm 75.0) was reported to be May 7-13 for yearling Chinook, May 14-20 for coho salmon, May 21-27 for steelhead and three peaks for sub-yearling Chinook - May 14-20, June 6-10 and July 2-8 (E.M. Dawley et al. 1984).

Residualism: To maximize smolting characteristics and minimize residualism, WDFW adheres to a combination of acclimation, volitional release strategies, size, and time guidelines. Minimal residualism from WDFW Chinook programs following these guidelines has been indicated from snorkeling studies on the Elochoman River (Fuss 2000).

- Feeding rates and regimes throughout the rearing cycle are programmed to satiation feeding to minimize out of size fish.
- Based on past history, fish have reached a size and condition that indicates a smolted condition at release.
- Fish have been acclimated and imprinted to the site before release.
- Releases from these ponds are volitional with large proportions of the populations moving out initially with the remainder of the population vacating within a couple of days.

Migration Corridor/Ocean: The proposed added production will increase total hatchery releases in the Columbia River Basin to around 155 million fish. It is unknown to what extent listed fish are available both behaviorally and/or spatially on the migration corridor. Once reaching the Columbia River, fish appear to travel quickly. (See also *Competition*).

Monitoring:
Associated monitoring and evaluation and research programs: The recreational fisheries in the Hanford Reach are intensely monitored for harvest and to assess contributions from in and out of basin hatcheries. The goal of the Hanford Reach creel survey is to sample a minimum of 20% of the effort associated with the sport fishery. Staff are stationed at each of the primary boat launches in the Hanford Reach; Vernita Bridge, White Bluffs, and Ringold.

The Ringold Springs Hatchery is located upstream of the listed Middle Columbia River steelhead and downstream of listed Upper Columbia spring Chinook and steelhead spawning, rearing habitat and migration pathways. The WDFW uses gear, timing, and harvest regulations to optimize harvest of targeted fish and minimize impacts to listed fish. If WDFW determines through monitoring activities that risks are unacceptable to listed stocks, timing, area, and gear restrictions will be adjusted. WDFW has an ESA Section 10 permit (#1554, August 20, 2010), for any incidental take of listed UCR spring Chinook and USR listed summer steelhead created by the Ringold salmon harvest.

A comprehensive monitoring and evaluation program (M&E) was developed and implemented in 2011 for the Ringold Springs Hatchery fall Chinook salmon production. A similar program was developed for Priest Rapids Hatchery fall Chinook production in 2010. These two M&E programs annually monitor juvenile fish production and adult returns from hatchery produced fall Chinook in the Hanford Reach. **See Appendix 1**.

Homing and Straying of RSH Released Fall Chinook Salmon:
Stray rates were determined by expanding recoveries of CWT RSH fall Chinook salmon on spawning grounds and within and outside the Hanford Reach by the juvenile mark rate and survey sample rate. Targets for strays based on return year (recovery year) and brood year should be less than 5% or 10% depending upon the location of straying. The percentage and number of RSH fall Chinook salmon straying into hatcheries and other basins outside the Hanford Reach has been very low (**Tables 2.2.3.1 & 2.2.3.2**). Based on the historical average, roughly 15% of the RSH returns have been observed at Priest Rapids Hatchery. Beginning in broodyear 2007, RSH began using Priest Rapids Hatchery for all egg takes. Any RSH returns to Priest Rapids Hatchery

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in 2011 or later will not have an impact on the genetics at Priest Rapids Hatchery other than increasing the proportion of hatchery fall Chinook salmon in the return. A relatively large proportion of the RSH returns fall Chinook salmon are observed in the Hanford Reach natural fall Chinook salmon escapement. On average, 67% of the RSH CWT returns were observed during spawning surveys in the Hanford Reach (**Table 2.2.3.3**). On average, about 1.3% of the RSH fall Chinook salmon returns have strayed into outside of the target stream well, below the target of 5% (**Table 2.2.3.3**). This stock has shown a high fidelity back to area of release, The new facility design will include a 90cfs river intake that will be combined with the spring water to create a distinct attraction to returning adults.

Table 2.2.3.1: Estimated number and percent of total brood return of Ringold Springs Hatchery-origin fall Chinook salmon returns trapped at hatcheries. Estimates were derived coded-wire tag recoveries expanded by juvenile mark rates and survey sample rates.

Brood Year	Target Hatchery		*Non-Target Hatcheries*								Hatcheries Combined
	Ringold Springs		*Priest Rapids*		*Bonneville*		*Lyons Ferry*		*L.White Salmon*		
	#	%	#	%	#	%	#	%	#	%	
1994	14	66.7	7	33.3		0.0					21
1995	502	87.8	53	9.3	17	3.0					572
1996	2,599	86.1	397	13.2	4	0.1			19	0.6	3019
1997	79	69.9	34	30.1							113
1998	1,618	75.7	484	22.6			35	1.6			2137
1999	902	79.3	235	20.7							1137
2000	737	91.7	53	6.6	14	1.7					804
2001	1,341	91.3	127	8.7							1468
2002	550	94.2	34	5.8							584
2003	14	50.0	14	50.0							28
2004	0	0.0	25	100.0							25
2005	0	0.0	0	0.0		0.0					0
2006	63	80.8	13	16.7	2	2.6					78
Totals	**8,419**	**84.3**	**1,476**	**14.8**	**37**	**0.4**	**35**	**0.4**	**19**	**0.2**	**9,986**

Data Source: Steven Richards, WDFW 2013.

Table 2.2.3.2: Estimated number and percent of Ringold Springs Hatchery fall Chinook recovered on spawning grounds by brood year. Number of fish estimated from coded-wire tag recoveries expanded by juvenile mark rates and survey sample rates.

Brood Year	Target Stream		*Non-Target Streams*								Streams Combined
	Hanford Reach		*Wenatchee*		*Yakima*		*W. Salmon*		*Okanogan*		
	#	%	#	%	#	%	#	%	#	%	#
1994	100	100.0									100
1995	640	100.0									640
1996	2,704	99.9	4	0.1							2,708
1997	159	100.0									159
1998	5,247	94.2			10	0.2	87	1.6	225	4.0	5,569
1999	3,284	100.0									3,284
2000	3,748	100.0									3,748
2001	1,214	100.0									1,214

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2002	138	100.0								138
2003	14	100.0								14
2004	0	0.0								0
2005	0	0.0								0
2006	315	100.0								315
Total	**17,563**	**98.2**	**4**	**0.0**	**10**	**0.1**	**87**	**0.5**	**225**	**1.3**	**17,889**

Data Source: Steven Richards, WDFW 2013.

There have been no recoveries on the spawning ground of Ringold fall Chinook in the Snake Basin.

On average, about 1.3% of the RSH fall Chinook salmon returns have strayed into outside of the target stream well, below the target of 5% (**Table 2.2.3.3**).

Table 2.2.3.3: Estimated number and percent of Ringold Springs Hatchery Origin fall Chinook recovered within and outside of target spawning areas. Number of fish estimated from expanded coded-wire tag recoveries.

Brood Year	**Number of RSH Origin Recoveries**	**Homing**					
		Target Hatchery		**Target Stream**		***Outside of Target Stream***	
		#	**%**	**#**	**%**	**#**	**%**
1994	114	14	12.3	100	87.7	0	0.0
1995	1,142	502	44.0	640	56.0	0	0.0
1996	5,314	2,599	48.9	2,704	50.9	11	0.2
1997	238	79	33.2	159	66.8	0	0.0
1998	7,186	1,618	22.5	5,247	73.0	321	4.5
1999	4,186	902	21.5	3,284	78.5	0	0.0
2000	4,485	737	16.4	3,748	83.6	0	0.0
2001	2,555	1,341	52.5	1,214	47.5	0	0.0
2002	688	550	79.9	138	20.1	0	0.0
2003	57	43	75.4	14	0.0	0	0.0
2004	0	0	0.0	0	0.0	0	0.0
2005	0	0	0.0	0	0.0	0	0.0
2006	378	63	16.7	315	83.3	0	0.0
Mean	**26,343**	**8,448**	32.1	**17,563**	66.6	**332**	1.3

Data Source: Steven Richards, WDFW 2013.

- Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.

In 2011there were 3 wild steelhead encountered in the Ringold trap during fall Chinook salmon collection. In 2010 there were 5 wild steelhead encountered in the trap. These fish were removed and returned unharmed to the Columbia River. No known mortality occurred from handling these fish.

- Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).

Not applicable - listed fish are not taken. Listed UCR steelhead, when identified in the traps, are transported via the adult return pipe back to the river at both the Ringold and I-182 facilities.

- Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

Not applicable.

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SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. *Hood Canal Summer Chum Conservation Initiative*) or other regionally accepted policies (e.g. the NPPC *Annual Production Review* Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.

For ESU-wide hatchery plans, the production of URB Fall Chinook from Ringold Springs Hatchery is consistent with:

- 1998 Biological Assessment and Management Plan; Mid-Columbia River Hatchery Program April 1998.
- 1999 Biological Opinion on Artificial Propagation in the Columbia River Basin
- 1999 Review of Artificial Production of Anadromous and Resident Fish in the Columbia River Basin
- Lower Columbia Salmon and Steelhead Recovery and Subbasin Plan (LCFRB 2004, 2010)
- Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1994)
- The *U.S. v. Oregon* Columbia River Fish Management Plan
- NWPPC Fish and Wildlife Program

In addition, hatchery programs in the Columbia system adhere to a number of state-wide guidelines, policies and permit requirements in order to operate. These constraints are designed to limit adverse effects on cultured fish, wild fish and the environment that might result from hatchery practices. Following is a list of guidelines, policies and permit requirements that govern WDFW Columbia hatchery operations. The URB fall Chinook salmon program from Ringold Springs Hatchery is consistent with the following WDFW Policies*:*

Genetic Manual and Guidelines for Pacific Salmon Hatcheries in Washington. These guidelines define practices that promote maintenance of genetic variability in propagated salmon. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995).

Spawning Guidelines for Washington Department of Fisheries Hatcheries. Assembled to complement the above genetics manual, these guidelines define spawning criteria to be used to maintain genetic variability within the hatchery populations. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 7, IHOT 1995).

Stock Transfer Guidelines. This document provides guidance in determining allowable stocks for release for each hatchery. It is designed to foster development of locally-adapted broodstock and to minimize changes in stock characteristics brought on by transfer of non-local salmonids (WDF 1991).

Washington Department of Fish and Wildlife Commission Policy C-3619. WDFW adopted the Hatchery and Fishery Reform Policy C-3619 in 2009. Its purpose is to advance the conservation and recovery of wild salmon and steelhead by promoting and guiding the implementation of hatchery reform. The intent of hatchery reform is to improve hatchery effectiveness, ensure compatibility between hatchery production and salmon recovery plans and rebuilding programs, and support sustainable fisheries. WDFW Policy C-3619 works to promote the conservation and recovery of wild salmon and steelhead and provide fishery-related benefits by establishing clear goals for each state hatchery, conducting scientifically defensible-operations, and using informed decision making to improve management. It is recognized that many state operated hatcheries are subject to provisions under U.S. v. Washington (1974) and U.S. v. Oregon and that hatchery reform actions must be done in close coordination with tribal co-managers (available at http://wdfw.wa.gov/commission/policies/c3619.html).

3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

The program described in this HGMP is consistent with the following agreements and plans:

- 1997 Cooperative agreement between the U.S. Army Corps of Engineers (COE), the Washington State Department of Fish and Wildlife (WDFW), the National Marine Fisheries Service (NMFS, NOAA Fisheries), and the Bureau of Reclamation (BOR) to share the facilities at RSRF for the benefit of the upriver bright fall Chinook salmon for John Day Mitigation and Bonneville Hatchery
- ACOE – John Day Mitigation Plan
- 1997 Inter-Agency Cooperative Agreement (USACE, WDFW, NMFS, & USBR)
- The Columbia River Fish Management Plan
- The Columbia River Anadromous Fish Restoration Plan of the CTUIR (Nez Perce, Umatilla, Warm Springs, and Yakama Tribes).
- The *U.S. v. Oregon* Columbia River Fish Management Plan
- Integrated Hatchery Operations Team (IHOT) Operation Plan 1995 Volume III.
- Pacific Northwest Fish Health Protection Committee (PNFHPC)
- In-River Agreements: State, Federal, and Tribal representatives
- Northwest Power and Conservation Council (NPCC) Sub Basin Plans (Prior to 2003 the NPCC were referred to as the Northwest Power Planning Council-NPPC).

3.3) Relationship to harvest objectives.

URB Chinook production from Ringold and the parent Priest Rapids Hatchery program contributes significantly to ocean, Columbia River commercial and recreational fisheries, and Treaty Indian fisheries in Zone 6 of the Columbia River. Harvest of these fall Chinook takes place in: the Canadian Troll fishery, the Canadian sport and net fisheries, the Washington/Oregon coastal sport and troll fisheries, Alaskan sport and troll fisheries, Columbia River net and freshwater sport fisheries.

Coded-wire tagged URB fall Chinook indicate that contribution to fisheries is highest in freshwater commercial and recreational fisheries, as well as British Columbia and Alaska ocean commercial fisheries.

3.3.1) Describe fisheries benefitting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

Table 3.3.1.1: Ringold Springs Hatchery Sub-yearling Fall Chinook Fishery Contributions.

Brood Years: 2000-2009[a] Fishery Years:2004-2013		
	Average SAR%[b]	**0.21**
Agency	**Non-WA Fishery**	*% of total Survival*
ADFG	All	*12.4*
CDFO	All	*16.6*
CDFW	All	*0.1*
Agency	**OR Fishery**	*% of total Survival*
ODFW	10- Ocean Troll	*0.4*

ODFW	21- Columbia R. Gillnet	*22.4*
ODFW	40- Ocean Sport	*0.3*
ODFW	44- Columbia R. Sport	*4.6*
ODFW	45- Estuarine Sport	*0.6*
ODFW	50- Hatchery Escapement	*0.3*
ODFW	72- Hatchery Escapement	*0.2*
Agency	**WA Fishery**	*% of total Survival*
WDFW	10- Ocean Troll	*0.5*
MAKA	15- Treaty Troll	*0.8*
WDFW	15- Treaty Troll	*0.7*
WDFW	22- Coastal Gillnet	*0.2*
WDFW	23- PS Net	*0.0*
WDFW	41- Ocean Sport- Charter	*0.6*
WDFW	42- Ocean Sport- Private	*1.6*
WDFW	45- Estuary Sport	*0.1*
WDFW	46- Freshwater Sport[c]	*6.7*
WDFW	50- Hatchery Escapement	*17.1*
WDFW	50- Hatchery Escapement[d]	*1.3*
WDFW	54- Spawning ground[e]	*12.5*
	Total	*100.0*

[a] No CWTs released in BY 2005.

[b] Average SAR% = (tags recovered/tags released).

[c] Freshwater Sport based on RMIS CWT data, unlikely to full represent contribution.

[d] Based off of returns to Priest Rapids and Bonneville Hatcheries.

[e] Recoveries from spawners Moran Slough, Vernita Bar and in the Hanford Reach.

Source: RMIS 2014.

3.4) Relationship to habitat protection and recovery strategies.

The Hanford/Columbia River reach is managed at a much larger scale than the sub-basin or province, and within the sub-basin and province most of the fisheries management and habitat protection is guided through existing legal agreements such as:

Habitat Conservation Plan (HCP) - Operation, monitoring and evaluation of these programs is proposed through the Chelan and Douglas Counties PUD re-licensing HCP that started with the "Biological Assessment and Management Plan Mid-Columbia River Hatchery Program (1998)".

ESA – Permits allow direct, indirect take and incidental takes.

FERC – Federal Action Agencies summer spill at Ice Harbor and several Columbia Federal dams.

Sub-basin and Recovery Planning includes:

Confederated Tribes of the Umatilla Indian Reservation (CTUIR) Master Plan

Mid-Columbia River Sub-Basin Plans (Bonneville Dam to Priest Rapids Dam) - Salmon and Steelhead Production Plan (September 1, 1990).

Upper Mid-Columbia Mainstem Sub-basin Planning and the Upper Columbia Salmon Recovery Board: The County is a partner with Okanogan County, Chelan County, the Colville Tribes and the Yakama Nation. The mission of the *Upper Columbia Salmon Recovery Board* is to restore viable and sustainable populations of salmon, steelhead and other at-risk species through the collaborative efforts, combined resources, and wise resource management of the upper Columbia River region. The organization intends to approach salmon recovery efforts in a transparent and evolving process to restore fish populations for ecosystems and people.

Recent Habitat Conservation Plans: The various state and federal fisheries agencies, including NOAA Fisheries, United States Fish and Wildlife Service (USFWS), Washington Department of Fish and Wildlife (WDFW), three Native American tribes, the Chelan and Douglas Public Utility Districts, and an environmental organization, American Rivers, developed Hydro Power Habitat Conservation Plans (HCPs) for anadromous salmon and steelhead. Chelan PUD developed plans for the Rocky Reach and Rock Island Hydro Projects (Chelan PUD 2002a, 2002b). Douglas PUD (2002) developed a plan for the Wells Hydro Project. The plans commit the two utilities to a 50-year program to ensure that their hydro projects have no net impact on mid-Columbia salmon and steelhead runs. This will be accomplished through a combination of fish bypass systems, spill at the hydro projects, off-site hatchery programs and evaluations, and habitat restoration work conducted in mid-Columbia tributary streams. In addition to monitoring spawning activity (Initiation of Spawning, End of Spawning, Critical Elevation), The Washington Department of Fish and Wildlife (WDFW) has worked in cooperation with the Bonneville Power Administration (BPA), Grant County Public Utility District (GCPUD), Pacific Northwest National Laboratory (PNNL), Columbia River Inter-Tribal Fish Commission (CRITFC), Alaskan Fisheries, United States Fish and Wildlife Service (USFWS), and the Yakama Indian Nation to perform monitoring and impact analysis of flow fluctuations on emerging and rearing fall Chinook in the Hanford Reach during the past seven years (1998-2004). The objectives of the evaluations were to: determine start and end dates for implementation of the juvenile fall Chinook salmon protection operations; determine factors affecting susceptibility of fall Chinook fry to entrapment and stranding; estimate the number of juvenile fall Chinook salmon stranded (mortalities) and entrapped in isolated pools (at risk) due to reductions in discharge from Priest Rapids Dam; and to evaluate the effectiveness of operational guidelines developed in the Interim Protection Plan on reducing mortality of fall Chinook in the Hanford Reach.

3.5) Ecological interactions.

Below are discussions on both negative and positive impacts relative to the Ringold fall Chinook URB program.

(1) *Salmonid and non-salmonid fishes or species that could negatively impact the program*: Ringold fall Chinook smolts can be preyed upon through the entire migration corridor from release to the mainstem Columbia River estuary. Northern pike minnows and introduced spiny rays along the Columbia mainstem sloughs prey on Chinook smolts as well as avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons. Based on PIT tags recovered at a large Caspian tern nesting colony on Crescent Island, a dredge material disposal island in the Columbia River several miles downstream of the Snake River confluence, an annual average of 300,000 to 800,000 of the out-migrating juvenile salmonids from the Columbia reaching the estuary were consumed by the terns between 2000-2001 (Antolos et al. 2005). River otters (*Lutra canadensis*) are present in the lower Columbia region and may represent a substantial predation source on juvenile salmonids. Harbor seals (*Phoca vitulina*), Steller sea lions (*Eumetopias jubatus*), and California sea lions (*Zalophus californianus*) are commonly observed in the Columbia River estuary. Seals and sea lions reportedly prey on adult salmonids, although diet studies indicate that other fish species generally comprise the majority of their food. These mammals are often attracted to concentrated fishing effort and can be troublesome to both sport and commercial fishers by taking hooked or net-caught fish before they can be landed. Additionally, other hatchery fish may be a source of competition for RSH URB fall Chinook.

(2) Salmonid and non-salmonid fishes or species that could be negatively impacted by the program: Co-occurring natural salmon and steelhead populations in local tributary areas and the Columbia River mainstem corridor areas could be negatively impacted by program fish. Of primary concern are the ESA-listed endangered and threatened salmonids: Snake River fall-run Chinook salmon ESU (threatened); Snake River spring/summer-run Chinook salmon ESU (threatened); Lower Columbia River Chinook salmon ESU (threatened); Upper Columbia River spring-run Chinook salmon ESU (endangered); Columbia River chum salmon ESU (threatened); Snake River sockeye salmon ESU (endangered); Upper Columbia River steelhead ESU (endangered); Snake River Basin steelhead ESU (threatened); Lower Columbia River steelhead ESU (threatened); Middle Columbia River steelhead ESU (threatened); and the Columbia River distinct population segment of bull trout (threatened). Listed fish can be impacted through a complex web of short and long term processes and over multiple time periods which makes evaluation of this net effect difficult. The potential exists for large-scale hatchery releases of fry and sub-yearling ocean-type Chinook salmon to overwhelm the production capacity of estuaries (Lichatowich and McIntyre 1987). Estuaries may be "overgrazed" when large numbers of ocean-type juveniles enter the estuary en masse (Reimers 1973, Healey 1991).

WDFW is unaware of studies directly evaluating adverse ecological effects to listed salmon. See also **Section 2.2.3** Predation and Competition.

3) Salmonid and non-salmonid fishes or other species that could positively impact the program. Returning Chinook and other salmonid species that naturally spawn in the target stream and surrounding production areas may positively impact program fish. Decaying carcasses may contribute nutrients that increase productivity of the overall system. There are no species that are known to directly positively impact the program. Multiple hatchery programs salmonids releases into the Columbia River system along with listed species (Section 2), benefit the program by providing additional predation opportunity in the Columbia mainstem and estuary. Numerous non-salmonid fish – sculpins, lampreys and sucker etc. –also would provide the same indirect benefits.

4) Salmonid and non-salmonid fishes or species that could be positively impacted by the program. A host of freshwater and marine species that depend on salmonids as a nutrient and food base may be positively impacted by program fish. The hatchery program may be filling an ecological niche in the freshwater and marine ecosystem. A large number of species are known to utilize juvenile and adult salmon as a nutrient and food base (Healey 1980 and 1991). Wild co-occurring salmonid populations might be benefited as hatchery fish migrate through an area. The migrating hatchery fish may overwhelm predator populations, providing a protective effect to the co-occurring wild populations. Pacific salmon carcasses are also important for nutrient input back to freshwater streams (Cederholm et al. 1999). Successful or non-successfully spawner adults originating from this program may provide a source of nutrients in oligotrohic river systems and stimulate stream productivity. Carcasses from returning adult salmonids have been found to elevate stream productivity through several pathways, including: 1) the releases of nutrients from decaying carcasses has been observed to stimulate primary productivity (Wipfli et al. 1998); 2) the decaying carcasses have been found to enrich the food base of aquatic invertebrates (Mathisen et al. 1988); and 3) juvenile salmonids have been observed to feed directly on the carcasses (Bilby et al. 1996). Additionally, the Southern Resident killer whale (SRKW) DPS was listed as endangered under the Endangered Species Act in 2005. Both United States and Canadian researchers have conducted correlation studies revealing relationships between overall Chinook salmon abundance indices and SRKW survival and fecundity (Ford et al. 2010; Ward et al. 2009). Hanson et al. (2010) published a summary of information on prey consumed by SRKWs, confirming a high percent of adult Chinook salmon in the diet of Southern Residents in their summer range. As it is now recognized that SRKWs are especially dependent on Chinook salmon, as a preferred prey species this program could provide prey for listed SRKWs in their summer range.

SECTION 4. WATER SOURCE

4.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

Ringold Facility:

The primary water supply for rearing will be from the Columbia River intake. The water temperature recorded from the river sampling (Site C) reached a mid-January low of approximately 38 °F. Assuming that the river temperature follows the trend of the USGS Richland gage, there is a steady increase in temperature to approximately 58 °F in late June. The spring water supply temperature remains constant at approximately 60 °F, the groundwater temperatures are assumed to be in the 62 to 65 °F range during the rearing period from January to June. The warmer temperature water can be mixed with the colder primary supply from the river if needed during initial rearing. However, there is a limitation for mixing because of the amount of spring water available in the low period in March.

The main intake supply pipeline will supply flow rates up to 31 cfs from the existing Main Intake structure to the connection with the lower diversion supply pipeline, and 59.3 cfs, from that point to the proposed distribution tower. The design flow for the river intake system is 90 cfs, which is sufficient to operate the proposed development during the months when the spring water supply is small or absent completely.

Ground water will be used primarily for incubation at the facility. The capacity of the system is 5 cfs. The ground water will be pumped from wells through a cooling system, and then to a compartment in the distribution tower. The tower will allow the ground water to be distributed to the rest of the facility at a nearly constant head. The cooling is required since the ground water is warmer than required for incubation. Closed loop heat exchanger with cooling towers will be used to reduce the temperature of the ground water by 15 degrees Fahrenheit.

Water from the Columbia River will be required in addition to the available water from Ringold Springs. The design flow is 90 cfs. The preferred intake structure has a deck above the high water; this arrangement addresses the concern for maintenance access. The structure supports three vertical pumps each having a capacity of 45 cfs. Normal maximum operation requires two of the pumps to be operating with the third pump providing redundancy for maintenance or mechanical failure. The screens are cleaned by an air burst system. The screens are sized to provide an approach velocity of less than 0.4 feet per second and will meet NMFS screen criteria..

The water temperature required for incubation should be in the range of 48 to 52 degrees Fahrenheit (°F). Typically, groundwater is the preferred source of water supply for incubation because of its clarity.

The three proposed water sources, river water, spring water, and groundwater, are all supplied into a common water distribution tower. The distribution tower provides a steady, uniform pressure to the individual facilities, however internal walls in the tower prevent the water sources from mixing.

There are three water supply lines leaving the distribution tower: one carrying river water, one carrying spring water, and one carrying groundwater. This arrangement permits the water supply to be mixed at the point of use, based on the individual needs at each pond or other facility.

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Table 4.1.1: Process Water Supply Line Sizing Results.

Supply Line	Maximum Design Flow (cfs)	Diameter (inches)		Velocity (fps)	
		Min	Max	Min	Max
Spring Water	59.3	18	48	4.7	11.4
River Water	90	18	48	4.7	11.4
Groundwater	4.2	18	18	2.8	2.8

Source: Tetra Tech DDR 2014.

A new potable water supply well will be provided at a location southeast of the incubation building. It is anticipated that the new well will be the same configuration as the existing well supplying potable water to the residence and shop. This is an 8-inch diameter casing placed into the deeper aquifer layer below the site, 170 feet below the existing ground surface. A 1-inch diameter PVC pipe from the well will provide water to the bathrooms and the kitchen in the Incubation Building. All hatchery process water is supplied from the Process Water Supply system. A similar new potable water supply well will be provided for the three residences.

Table 4.1.2: Record of NPDES permit compliance at Ringold Hatchery through 2012.

Facility	Reports Submitted? Y/N			Last Inspection Date	Violations Last 5 yrs? (list)	Corrective Actions? Y/N	Meets Compliance? Y/N
	Monthly	Qtrly	Annual				
Ringold WAG13-7009	Y	Y	Y	3/4/2008	0	N	Y

Source: Hatchery Data Unit 2012.

<u>I-I82 Facility:</u>

Water from the Yakima River will be required at a design flow of 30 cfs. The river water system is composed of two major elements, the intake structure, and the pump structure. The intake structure supports two cone screens on its top. The screens are cleaned by a hydraulic brush system. The hydraulics and controls are located on shore at the pump structure. The screens are sized to provide a maximum approach velocity of less than 0.4 feet per second. The screens are designed so that they may be removed from the structure of periodic maintenance by a barge mounted crane. The screens are designed to meet NMFS screening criteria. The pump structure is located on the shore of the river above the 100-year flood elevation. The structure supports three vertical pumps each having a capacity of 15 cfs. Normal maximum operation requires two of the pumps to operating with the third pump providing redundancy for maintenance or mechanical failure. Due to the importance of maintaining flow at the facility, emergency power is provided to operate two of the pumps at a time.

Temperature data for both of the Yakima River sampling sites indicate that temperatures in the river are higher than the ideal for adult holding from August through the end of September when they drop to approximately 55 degrees. The Yakima River temperatures were the higher of the two water sources, reaching over 80 degrees in July. The Side Channel temperatures stayed relatively constant through the period, varying from the upper to mid-60 degree range. Water temperatures in both the river and side channel in late February averages in the mid 40's, and rises to the mid 60's in late June when juvenile sub-yearlings would be released.

The maximum water demand for the project occurs during adult holding when the fish ladder and adult return pipe are all operating, from September through December. The maximum flow requirements for each dual use pond is the same as when they are being used for rearing, or 10.2 cfs each. With both dual use ponds in operation the total maximum flow requirements for the dual use ponds is 20.4 cfs. At the same time that the dual use ponds are in use for adult holding the adult return flume (8.0 cfs), miscellaneous (1 cfs) and the fishway (14.7 cfs) are also in operation. The drain flow through the ponds during the adult holding mode is routed to supply the 14.7 cfs in the fishway, with the surplus drain flow going to the fishway entrance for added attraction flow. The total water requirements during the adult return period are 29 cfs. The design of the intake structure, the pump house structure, and the supply line into the pump house was based on a flow rate of 30 cfs.

A domestic will be drilled to provide potable water to the Facility Office Trailer and to the Facility Host Trailer Pad. Ground water from the existing storm water runoff pond will be used only for imprinting. The existing irrigation well, used by Corps of Engineers, Walla Walla (CENWW), will not be used by the project.

4.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

<u>Ringold Facility:</u> Water rights are formalized thru surface water right S3-28301C (Q_i = 10 cfs), S3-00408C (Q_i = 30 cfs), S3-27815C (Q_i = 15 cfs), and S3-27816C (Q_i = 15 cfs), issued by the WA Department of Ecology. Monitoring and measurement of water usage is reported in monthly NPDES reports.

The Ringold Springs spring water supply does not have listed fish in the system. The existing Columbia River pump barrel screen openings are 1mm in diameter and do not impact listed fish. The system has a reverse blow back system to clean the structure of debris, however the river diversion is not being used because the water right application applied for on 4/1/1993 is still pending. The new river intake will provide 90 cfs of flow for the newly designed facility. The 90 cfs represents less than one percent of the average Columbia River flow.

This facility operates and complies with limits under the “Upland Fin-Fish Hatching and Rearing” National Pollution Discharge Elimination System (NPDES) administered by the Washington Department of Ecology (DOE) - WAG 13-7009 and IHOT 1995 which act to protect the quality of receiving waters adjacent to the hatchery.

A single discharge line is provided which conveys the project discharge water from the facilities into the existing Ringold Springs Creek, near the location of the existing discharge from the 9-acre Pond. This discharge point was selected so that the discharge water being released would also serve as attraction flow into the fish ladder. The discharge water is provided primarily from the rearing and dual use ponds, however collection points are also provided from the pollution prevention pond.

The discharge line segments from the rearing ponds to the outlet in the Ringold Springs Creek will also serve to release the juvenile salmon into the wild. As such, these segments of the discharge line have been designed to provide a smooth inside surface, which will minimize hazards for the departing juveniles. Where the discharge line segments join, the connections are made using 45-degree wye's to provide the smoothest flow path possible, with access to the discharge line being provided by manholes placed upstream of the discharge line, out of the flow path of the departing juveniles.

The process water discharge lines are sized to operate under open channel flow, with a flow velocity from 6 to 12 feet per second when operating at full design capacity. At the outfall, the invert of the discharge line was placed below the water surface level in the pool, and a rock outfall pad is provided to prevent erosion of the channel.

A 160-foot by 120-foot, reinforced concrete pollution control pond with six treatment cells is located above the juvenile rearing ponds. It is used to decant the uneaten food and fish feces vacuumed from the bottom of the juvenile rearing ponds. The decanted fluid outflow from the pollution abatement pond is discharged through the process water discharge system after settling is complete. At the end of the rearing season, the pond is drained and the solid matter is allowed to dry. Once dry, it is removed by front-end loader and disposed of. The reinforced concrete pond walls have been designed in accordance with EM 1110-2-2104. The control and construction joint layout is important in minimizing shrinkage cracks.

<u>I-182 Acclimation Site:</u>

The USACE has a 40 gpm/20 acre foot water right for irrigation of 5 acres at this site (Reference No. G4-28278NWRIS). There does not appear to be any surface water rights associated with this parcel. This existing water right is currently being used by Corp of Engineers Walla Walla (CENWW). An application for the water rights for the river water intake, well for potable water, and the groundwater for imprinting is in progress; it is anticipated that this will be acquired in time to meet schedule as most of the water will be a non-consumptive right.

Discharge from the dual use ponds enters the upper and lower fish ladder; in addition, two overflow weirs at the upper ladder divide the additional discharge between the upper and lower ladder. These discharge points were selected so that the discharge water being released would also serve as attraction flow into the fish ladder.

The discharge line segments from the dual use ponds to the outlet in the Yakima River will also serve to release the juvenile salmon into the wild. As such, these segments of the discharge line have been designed to provide a smooth inside surface, using HDPE piping preferably, which will minimize hazards for the departing juveniles. Where the discharge line segments join, the connections are made using a 30-degree forge molded bend to provide the smoothest flow path possible.

The decanted fluid outflow from the pollution abatement pond is discharged to the Yakima River after settling is complete. At the end of the rearing season, the pond is drained and the solid matter is allowed to dry. Once dry, it is removed by front-end loader and disposed of.

The reinforced concrete pond walls have been designed in accordance with EM 2104. The control and construction joint layout is shown on the plans and is important in minimizing shrinkage cracks.

The pollution abatement ponds are designed to settle out solids that are primarily from vacuumed waste from the juvenile rearing ponds. A submersible solids pump will lift vacuumed flow that passes by gravity to a pump lift station located nearby the PA Ponds. The ponds are based on a WDFW standard design in which the solids pumped into the PA ponds are settled out over several pond cleaning cycles. There are enough ponds provided so that there will be only one pond offline for decanting during juvenile rearing. Excess water is draining off the surface after the solids have settled out, and the solids are removed and transported to a proper approved disposal facility. There will be normal preventative maintenance and lubrication of moving parts on the supply valves, decanting drain, and pump station maintenance. A reinforced concrete, pollution control pond with two treatment cells is located above the Dual Use Ponds. It is used to decant the uneaten food and fish feces vacuumed from the bottom of the Dual Use Ponds. The Pollution Abatement Pond is similar to the one in use at the Lewis River Hatchery and other WDFW facilities.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Ringold Facility: Beginning with brood year 2008, fall Chinook broodstock used for the Ringold Springs program was collected at Priest Rapids Hatchery. Adult fish are spawned at Priest Rapids and the eyed eggs are sent to Bonneville Hatchery.

The proposed program and hatchery rebuild will allow for RSH and the associated I-182 Acclimation Site to collect fall Chinook on-site for broodstock. In the event there is a shortage of adult fall Chinook collected at Ringold Springs Hatchery or the I-182 Acclimation Site, fall Chinook returning to the Priest Rapids hatchery may be used. Trapping of returning fall Chinook salmon takes place approximately one mile south of the main Priest Rapids facility, at the volunteer adult trap on Jackson Creek (aka Moran Slough) (Lewis and Pearson, 2010).

Based on analysis of CWT returns to Ringold Springs Hatchery, natural-origin fall Chinook may need to be collected off-site and incorporated into the broodstock. With the design of the new intake and adult collection facility at Ringold it may recruit natural origin fish at a higher rate that the current facility. Adults have been collected from the east off ladder adult fish trap (OLAFT) at Priest Rapids Dam. Currently under review is the potential to use these fish as the wild component for the hatchery broodstock. Adults are collected throughout the entire run to ensure that the run timing for these populations is maintained. (See also **Priest Rapids HGMP**). Other methods, such as volunteer angler broodstock collection currently being used at Priest Rapids Hatchery, may be evaluated to collect natural-origin fall Chinook for incorporation into the Ringold broodstock.

Broodstock Collection at the Ringold Facility:
Adult Returns Pre-Sort Pond

The presort pond is a rectangular concrete pond located upstream of the exit from the concrete fish ladder. The total average length of the pond extending from the upper fish channel to the opposite end of the pond is approximately 113 feet. The pond walls are 13 feet high, which provides 5 feet of free board, the purpose of which is to contain jumping fish within the pond. The usable space in the pond is 100 feet long, 20 feet wide, and has 8 feet of water depth, resulting in a usable holding volume of 16,000 cf. The presort pond water supply is 8 cfs from the spring water. The spring water is used as the supply source for attracting returning adult fish that were raised on the imprint water as juveniles. Water enters the presort pond at the upstream end through an up-well in the floor, passes through the pond uniformly to the downstream end to the ladder, and out through the fish return channel. Level alarms will be installed to monitor the pond water surface. The purpose of the presort pond is to provide a temporary holding and resting space for adult fish after exiting the fish ladder prior to sorting. It is used only for holding adult fish, and does not have the dual use capability to hold juvenile fish as the adult holding ponds do. The presort pond facilities are the first in the series of facility components in the adult to incubation part of production. Fish are held in the pond between the picket rack/v-trap located at the pond outlet to the west and the false weir on the east end. The primary components of the presort pond are the pond (horizontal) crowder, the vertical crowder, and the false weir.

Given the short-term holding density (0.25 cf/lb), and assuming an average fish size of 20 lbs, the pond provides the capacity to hold 3,100 returning adults. The number of fish entering the pond will be controlled by a gate at the fish ladder entrance. The gate actuator will be controlled by a fish counter that will send a close gate signal when the maximum presort pond capacity is reached. If the daily adult return is higher than 3,100, the reminder of the run will hold in the lower fish ladder.

The pond v-trap allows adults to pass from the fish ladder into the pond, but prevents travel back down the upper fish ladder. The trap assembly is fabricated out of parallel 1 ¼-inch aluminum tube that spans the width of the pond. The "v" portion of the trap is positioned in the middle of the pond channel. It has a wide opening on the entrance side, and a narrow opening on the exit side, which forms a "v" shape. Vertical panels extend from each side of the narrow exit opening of the trap to the walls forming a flat vertical plane and the downstream wall of the pond. There are also panels extending in the same manner from the wider entrance portion of the trap to the outside walls, which assist in guiding fish to the entrance.

The presort pond crowder is intended to coax fish with a flat vertical picket panel to move horizontally from the entrance through pond to the upstream end of the pond. The picket panel is slightly less than 20 feet wide and 13 feet high and fits within the pond perpendicular to the side walls. The crowder panel bars consist of parallel aluminum tubes with a 7/8-inch clear spacing between the tubes, forming a vertical plane that will pass through water. The picket tubes are oriented vertically so that when in place at the sorting end of the pond, fish moved up by the vertical crowder will not be pinched between bars. Stiff bristled brushes are fixed along the edges of the crowder panel to seal the gap between the pond walls and the sides of the crowder panel. The crowder panel is designed to rise vertically so the base of the panel clears the pond water surface. This allows the crowder to cycle back to the downstream end of the pond above the water surface without crowding fish in reverse back toward the entrance to the starting position against the v-trap. A vertical crowder is located at the upstream end of the Presort Pond. It is anticipated that many of the fish crowded toward the end of the pond are expected to clear the presort pond volitionally via the false weir. The purpose of the vertical crowder is similar to that of the horizontal crowder. It is to coax the last remaining fish in the pond vertically through the space formed between the between the horizontal crowder panel and the pond wall through the false weir.

The primary function of the sorting facility is to sort, evaluate, organize, distribute, and spawn the adult salmon returning to the Ringold facility. The facility located in series between the presort pond and the dual use adult holding ponds. Fish pass from out of the presort pond and are immediately anesthetized before passing to the sorting table. From the electro-anesthesia (EA) system, fish are sorted by species and gender, then evaluated for maturity and program need, then distributed through a flume system to various locations within the facility. Fish that are to be spawned enter the sorting table from the opposite (east) end of the table from the dual use ponds.

Electro-Anesthesia

The electro-anesthesia assembly consists of two baskets that are submerged into tanks of water. The purpose of the EA system is to put fish under anesthesia for a short period of time to allow manual sorting and handling. Adult fall Chinook are large active fish, and when under anesthesia they become docile, minimizing injury to the fish and the persons trying to handle the fish. Electric current is applied through the tanks in two stages, initially at a low voltage for a short burst (20 to 30 seconds), then a longer burst (30 to 60 seconds) at a higher voltage. The rate at which the voltage is applied and effective is site specific, and varies with the size of fish, conductivity of the water, and operator preferences.

Fish pass over the false weir and are diverted by the splitter gate into one of the two baskets. The splitter gate is controlled by the EA unit operator, who controls the operation of the diversion gate, and the flow of fish to the baskets based on the capacity. Each 45-cf basket/tank can anesthetize roughly 20 adult Fall Chinook salmon. The electro-anesthesia baskets measure approximately 5 feet by 3 feet and have a water depth of 3 feet. With the dual basket system, fish can be loaded, anesthetized, and moved onto the sorting table at approximately 2.5 minutes per cycle. In an 8-hour period, if operated continuously, 3,840 fish could be handled and sorted, which is slightly more than the capacity of the presort pond.

Sorting Table and Flumes

The purpose of the sorting table is to quickly distribute fish to various locations through sorting tubes mounted along the outside edge of the table. The sorting table is brushed stainless steel, with a rolled edge to prevent fish from falling to the floor. The table is aligned in an east-west orientation, so that fish slide in a straight line out of the EA baskets onto the table. Fish enter the table from the presort pond on the west side or from the Dual Use ponds on the east side. A funnel shaped ramp provides a transition from the parallel arrangement of either EA basket systems (6-feet wide) to the 2-foot wide sorting table. The table stands 36 inches high from the floor on the EA basket end and slopes down to 32 inches high on the opposite end of the table. There are rectangular entrances to the 11 sorting flumes positioned along the north end and extending off the back of the table through openings in the north building wall. Rectangular to circular transitions are fabricated into the tables backsplash, each with flange that will meet with the flanges end of the flume. Each flume is wetted to facilitate smooth fish transport along the flumes. The spawning table intersects the east end of the main sorting table at a right angle to the south. A removable panel diverts fish to be spawned to the table. The spawning area includes a spawning table, two stunners, and a fertilization station. Fish slide out of the EA lift, exiting onto the spawning table where staff quickly passes them through the stunner on the spawning table. The carcasses are manually hand-wanded for coded wire tags and are segregated by gender for spawning. Fish carcasses are passed below via the circular flumes to totes located on the ground floor area allowing direct access for transfer to trucks waiting in the adjacent parking area. There are two stunners available to humanely euthanize fish. The surplus fish totes are 51-inch square bins. Fish found to have tags will be separated so the tags can be retrieved. Further refinement of the equipment necessary for the spawning area will be conducted during the plans and specifications phase of the project. The first sorting flume, located closest to the anesthesia system, is for return-to-river fish. The subsequent six flumes lead to the six adult holding ponds. The next groups of four flumes are for surplus fish, which pass from the sorting table down helical flumes to fish totes located at grade below the sorting facility. Between the adult pond flumes and the surplus flumes, fish are passed through a coded wire tag detector mounted on the table, then is euthanized with a fish stunner. A fish counter panel is located above the entrances to the first seven flumes.

Dual Use / Adult Holding Ponds

The dual-use ponds are large concrete vessels designed to function as holding ponds for adult fish and rearing ponds for juvenile fish. The six rectangular concrete ponds are located adjacent to the sorting facility oriented in a north/south direction and aligned symmetrically with the sorting table and transfer flumes. The components of the dual use adult holding ponds are the drain structure, the pond crowders, the crowder transfer carriage, the end channel crowder, the upwell supply system, and the drain/water level control system.

The ponds measure 200 feet in length, 20 feet in width, and have an average water depth of 8 feet. The total holding volume per pond is 32,000 cf. At the long term holding density criteria of 0.50 cf/lb, and a fish size of 20 lbs, each pond can hold 3,200 returning adults. Each pond is supplied with a maximum of 10 cfs through an up well located in base of the crowding channel at the south end of each. The ponds have been designed to enable switching operation between adult holding and rearing.

Recovery Tank and Adult Return Flume

The purpose of the recovery tank is to hold fish that are to be returned to the river long enough to recover from the effects of anesthesia. The recovery tank is a rectangular concrete tank that is located adjacent to the splitter gate and EA system. It consists of two components; the recovery tank and the river return pipe supply structure. The tank is 10 feet long, 10 feet wide, and has 8 feet of water depth, for a total holding volume of 800 cf. At a short-term holding density of 0.25 cf/lb, and assuming a 20 lb fish weight, the tank can hold about 153 fish. Fish are delivered to the tank entering via the fish flumes on the east side of the tank. Fish exit the tank through a false weir located on the west wall. Some fish may pass out of the tank and into the fish return flume volitionally, however a vertical crowder/brail will be installed to force fish into the return channel if necessary

The false weir assembly is positioned between the recovery tank and the return to river pipe entrance. There are two flow supply pipelines, one high flow and the other low flow combined for a minimum 200 gpm and maximum of 5 cfs attraction flow. The recovery tank water surface is controlled by a 6-foot long adjustable weir located on the east wall of the tank, common to the return pipe supply structure. False weir flow that supplies the recovery tank passes through an opening in the interior wall of the tank located below the vertical crowder brail. From there it passes up to and over the adjustable weir and into the return pipe structure, located behind the false weir assembly. In addition to the 5 cfs flow passing from the recovery tank, an additional 3 cfs is supplied to the transition supply structure, for a total of 8 cfs to the adult return pipe.

The transition structure located between the false weir and the return pipe entrance is designed to introduce flow to the adult return pipeline with a minimal amount of turbulence, and pass fish to that flow with minimal stress. It is triangularly shaped starting at 8 feet and narrowing to 18 inches, with a floor that ramps up 2 feet 3 inches vertically in 14 feet. Water that passes over the adjustable weir spills into the 2-foot long energy dissipation section of the structure, with a starting velocity of 0.33 fps for the 8 cfs design flow. The 8 cfs includes the 5 cfs passing over the weir from the recovery tank, and the 3 cfs introduced into the transition. The final velocity at 8 fps of the supply flow through the transition meets the return pipe design velocity of 8 fps.

Fish pass through a separate fabricated flume a distance of approximately 24 feet, beginning at the top of the false weir and ending at the beginning of the return pipe. The purpose of the return to river flume is to provide the most direct return of the not targeted species of fish not destined for Ringold from the sorting facility back to the Columbia River to an exit location as close as possible upstream from the lower fish ladder entrance. The 20-inch (nominal) return pipe is supplied with 8 cfs. The Adult Return Flume is an 18-inch internal diameter pipe, which is fed by a controlled water supply at flume entrance transition. The flume transport flow is a continuous 8 cfs open channel flow throughout its length. Flow depth in the flume is 8.4 inches (51 percent of the inside diameter of the pipe) and the flow velocity is 10.5 feet/second. The total time required a fish to pass through the 1015 feet flume length is 97 seconds.

Table 5.1.1: Sorting and Holding Criteria per Tetra Tech DDR 2014.

Criteria	Design Value	Source	Notes
Inflow velocity	1.0 fps maximum velocity through (vertical) diffuser with baffling. 0.5 fps for horizontal diffusers	(NOAA) 4.3.2.1 (NOAA) 4.3.2.1	Also see NOAA Section 4.3.2 for overall diffuser requirements. Dissipate energy prior to distribution through diffusers per NOAA 4.3.6.
Normal Desirable Holding Time within Trap	Daily - 24 hours maximum, unless otherwise agreed to	(NOAA) 6.5.1.2	Move more often as required based on environmental (water temp, debris loading, etc.) and biological (migration peaks) conditions. Specifics to be determined as design progresses.
Fish Handling Personnel Qualifications	experienced or trained	(NOAA) 6.3.1.5	Use of qualified personnel to handle fish will assure fish safety.
General Trap System Criteria	gates, crowder, distribution fume, etc.	(NOAA) 6.4	See NOAA text for specifics. General guidelines for site specific trap needs.
Crowder Picket Spacing	7/8-inch clear bar spacing 1-inch maximum side gap.	(NOAA) 6.5.1.6	Use round bars for fish safety (NOAA, 5.3.2.9).

Table 5.1.2: Sorting Flume Criteria per Tetra Tech DDR 2014.

Criteria	Design Value	Source	Notes
Minimum Flume Width (or diameter) - Inside Diameter	15 inches	(NOAA) 6.4.1.4	This requirement was reduced down from 18-inches in 2008.
Minimum sidewall height	24 inches	(NOAA) 6.4.1.4	N/A if pipes used.
Other	Provide wetted invert for straight sections, with continuous wetting spray at all bends.	(NOAA) 6.4.1.4	Must be wetted, have smooth joints, sides, and bottom, and no abrupt vertical or horizontal bends. Use of circular pipes is OK.
Distribution Flume Slope for sliding fish.	8.5° angle (0.15 ft / ft)		Based on Cowlitz Salmon Hatchery flumes.
Bend Radius	R/D >= 5	(NOAA) 11.9.3.4	Bypass pipe criteria.
Other	Provide smooth joints.	(NOAA) 11.9.3.1	Provide smooth contact areas for all surfaces.

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Table 5.1.3: Sorting System Criteria per Tetra Tech DDR 2014.

Criteria	**Design Value**	**Source**	**Notes**
Sorting Anesthetic	Layout Preference - Fish should be anesthetized before handling.	(NOAA) 6.3.1.2	Use of anesthetic early in the sorting facility will reduce stress and potential injuries due to handling.
Anesthesia Bypass	Trap facilities shall be designed to allow non-target species to avoid anesthesia system.	(NOAA) 6.3.1.3	Use of visual sorting flume as first sort will allow bypass of anesthesia system for most species where applicable.
Anesthesia recovery area	Anesthetized fish shall be routed to a recovery pool.	(NOAA) 6.4.1.7	Consider pool hydraulics so no fish can be impinged on screens, racks, etc. Provide volitional release mechanisms (where applicable).

Table 5.1.4: Facility Holding Volume and Flow Criteria per Tetra Tech DDR 2014.

Criteria	**Design Value**	**Source**	**Notes**
Adult Short Term (24 hours Maximum)			
Density – NOAA Criteria	0.25 ft^3/lb (= 4 lbs/ft^3)	(NOAA) 6.5.1.2	Size ponds for average fish size x number of fish intended to be held at one time. Holding density reduced by 5 percent for every degree that water temperature exceeds 50 °F.
Flow Requirements	(0.056 gpm / lb=1.1 gpm/fish)	Senn, 1984	DO to be maintained between 6-7 ppm and adjusted for temperature. Consistent with Priest Rapids
Adult Long Term (Hatchery Brood)			
Density	0.50 ft^3/lb (= 2 lbs/ft^3)	Senn, 1984 IHOT, 1995	See note above under Short Term
Flow	0.07 gpm/lb for all species (= 1 gpm/15 lbs of fish)	Senn, 1984 IHOT, 1995	DO to be maintained between 6 to 7 ppm and adjusted for temperature. Consistent with Priest Rapids

Table 5.1.5: Adult Return Flume Hydraulic Performance per Tetra Tech DDR 2014.

Return Flume Pipe:		
Flume Flow Rate	8	cfs
Flow Depth	8.4 (51%	inches of Pipe ID)
Flow Velocity	10.5	feet/second
Transit Time	97	seconds
Release Height:		
at Low Water Level	9.5	feet
at High Water Level	2.5	feet
Impact Velocity at Low Water Level:		
Horizontal	10.2	feet/second
Vertical	24.7	feet/second
Total	26.8	feet/second
Impact Velocity at High Water Level:		
Horizontal	10.2	feet/second
Vertical	12.7	feet/second
Total	16.3	feet/second

Broodstock Collection - <u>I-182 Acclimation Site:</u>

Fish Ladder Entrance Channel, Fish Ladder

The pathway for returning adults is being provided by the construction a fishway with two components. The first is the Fish Ladder Entrance Channel, which is a concrete channel that is placed between the concrete fish ladder entrance and the shoreline of the Yakima River. The second is the concrete Fish Ladder, which is vertical slot fishway, leading from the entrance channel to the water surface operating level of the dual-use holding ponds.

The entrance will consist of a concrete channel that is angled at 30 degrees from perpendicular to the river. To reduce excavation in the river and to reduce the possibility of river bed material eroding into the entrance channel, the bottom of the entrance channel is set at two feet below the 95 percent annual exceedance level of the river. The top of the entrance channel is set above the 5 percent annual exceedance level to reduce the likelihood of fish jumping over the wall.

The fish ladder is the portion of the fishway, which connects from the dual use adult holding pond to the entrance channel. This structure is fed by drain flow from the adult holding pond. Fish exit the ladder at Water Surface Elevation (WSE) at 364.0 feet and enter the ladder into the entrance channel at WSE 346.5 feet. Since the transition zone where water surface elevations is affected by the river elevations extends into the fish ladder, a vertical slot fishway was selected. This allows adequate passage over a range of flows.

The Fish Ladder has been designed based on the criteria for a Vertical Slot fish ladder, as specified in the 2011 "NMFS Anadromous Salmonid Passage Facility Design", and in the 2000 "WDFW Fishway Guidelines for Washington State (Draft)". The fish ladder is a vertical slot design, utilizing an 8-foot wide concrete channel with 12-foot high side walls, which provide a 5-foot freeboard depth at the design flow of 14.7 cfs. Concrete baffle walls are placed at a 10-foot longitudinal spacing along the channel. The concrete baffles include an 18-inch wide slot with a 3 foot 6 inch sill. Each vertical slot is placed 12 inches above the preceding slot with a 10:1

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sloping floor, producing a 10:1 overall ladder slope. A 3-foot wide overflow weir is provided 18 inches above the sill of the slot to prevent excessive head drop when flow through the ladder is high. The concrete baffles provide holding pools in the fishway, which are 8 feet wide, 8 feet deep, and 9.5 feet long, providing a volume of 570 cubic feet. At the design flow rate of 14.7 cfs, this provides an energy dissipation factor (EDF) of 1.9 foot-pounds per second per cubic foot.

Table 5.1.6: Fish Ladder Design Summary per Tetra Tech DDR 2014.

Water Surface Design Parameters:		
Upstream WSEL	364.0	Feet
High Water Downstream WSEL	352.3	Feet
Low Water Downstream WSEL	346.5	Feet
Design Flow Rates:		
Low Design Flow	14.7	cfs
High Design Flow	30.0	cfs
Fish Ladder Pool Design Parameters:		
Length	9.5	Feet
Width	8.0	Feet
Depth	8.0	Feet
Slope	10:1	H:V
Number of Pools	18	Each
Slot Design Parameters:		
Slot Width	18	Inches
Sill Height	3.5	Feet
Overflow Slot Width	36	Inches
Overflow Sill Height	5.0	Feet
Maximum Head Drop	12	Inches
Baffle Spacing	10.0	Feet
Energy Dissipation Factor (EDF)	1.9	Foot-Pounds / Sec-ft³
Flow Depth Over Sill	4.75	Feet (Minimum)

Dual Use Holding Ponds:

The dual-use ponds are large concrete vessels designed to function as holding ponds for adult fish and rearing ponds for juvenile fish. There are two rectangular concrete ponds located on the site oriented in an east/west direction and aligned perpendicular to the river. The components of the dual use adult holding ponds are the pond crowders, the end channel crowder, the upwell supply system, and the drain channel/water level control system.

The ponds measure 200 feet in length, 20 feet in width, and have an average water depth of 8 feet with 5 feet of freeboard. The total holding volume per pond is 32,000 cf. At the long term holding density criteria of 0.50 cf/lb, and a fish size of 20 lbs, each pond can hold 3,200 returning adults. The short-term criteria for holding are 0.25 lbs/cf, which results in a 6,400 fish capacity. A pond spray system is provided to calm fish and minimize jumping. Each pond is supplied with a maximum of 10 cfs through an up well located in base of the crowding channel at the west end of each. The ponds have been designed to enable switching operation between adult holding and rearing. The ponds are not hydraulically isolated from one another during adult holding mode of operation, but can be during juvenile holding mode. This is possible by the use of a picket weir

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and bulkhead system at the crowding channel end of the ponds. The following is an explanation of the picket rack placement for adult pond mode of operation. A full width picket rack fits into guides located at the end of the pond walls. When in place, it creates a flush vertical wall for the crowding channel. A stationary hoist system is mounted over each picket rack to lift the picket rack clear of the opening when crowding fish out of the pond. The picket panel on the crowder moves into position below, replacing the raised panel. This system enables the end channel crowder to move fish toward the Electro Anesthesia (EA) unit preventing fish escaping around the end channel crowder when in place for adult operation; the pond end pickets create the east wall of the crowding channel. The picket rack and crowder picket panel consists of parallel 1 1/4-inch aluminum tube with 7/8-inch clear space between the tubes. The tubes are oriented horizontally to eliminate pinching fish when meeting up with the end channel crowder. Water surface control in normal operation is fixed by stoplog weirs located between guides on the drain end of each pond. A set of four stacked screen panels will be used for both juvenile and adult holding in each bay. Water level adjustment can also be accomplished with the rotating standpipe located on the end wall below the stoplogs. The standpipe invert is located at the top of slab to allow complete draining of the pond. The standpipe is fabricated with a 90 degree elbow and swivel fitting attached to the outside wall of the pond. A cable from a manual winch is attached toward the top of the standpipe, which allows the end pipe to pivot about the swivel, resulting in the ability to control the water surface independently in each pond. The floor slab is sloped from the southwest to the northeast. Water surface level alarms will be provided for all of the ponds.

Pond Crowder

There are two adult holding pond crowders with one serving each pond. The purpose of the crowders is to move fish through each of the ponds to the crowding channel. The two crowders are identical. The crowder panels are 20 feet wide, extend to the full wall height of 13 feet, and are equipped with brushes along the side and bottom edges to seal with the adult holding pond walls. The crowders move longitudinally along the full 200 feet of pond length. In the event that a pond needs to be segregated into two sections, one of the crowders can be used to segregate the ponds while the other is used for crowding in other ponds. A control panel is located on each crowder for operation of the crowder movement and panel lift.

Crowding Channel and Vertical Crowder

The end crowding channel for the adult holding ponds is aligned northwest and southeast perpendicular to the upstream end of the ponds. Fish are crowded from the ponds into the crowding channel where they move volitionally upstream or are crowded to the fish lift and EA system. Supply to the crowding channel is introduced in three locations; at the false weir and the two upwells, each located adjacent to the ends of each pond. The end channel crowder is provided to coax fish that do not move volitionally into the fish lift at the upstream end of the crowding channel. The rectangular concrete channel is 6 feet wide and 52-feet long. The crowding channel also has 5 feet of freeboard matching the adult ponds. The crowding channel crowder is a smaller version of the adult holding pond crowders. The panel pickets are flat vertically to enable meeting the vertical fish crowder brail at the end of the channel. The panel is approximately 6 feet wide and 12 feet high. The crowder is operated by controls on the crowder, or remotely controlled from the sorting table/spawning area. Brushes are positioned along the vertical edges of the crowder panel to seal the gap between the sides and the channel wall.

A vertical crowder is located at the upstream end of the crowding channel. The purpose of the vertical crowder is similar to that of the horizontal crowder. It is to coax the last remaining fish in the end of the crowding channel vertically slide over the false weir and into EA system. A recessed well is formed into the pond floor that houses the crowder. The primary components are the crowder panel assembly and the hoist structure. The vertical crowder panel consists of three flat sloped picket panels that converge toward the end wall and false weir opening. The panel forms the base of the assembly, which also consists of a structural frame and vertical walls guides. The hoist structure is fixed to the top of the pond walls, and supports a 1-ton hoist that lifts the panel assembly. When the horizontal crowder moves into position aligned with the edge of the recessed well, the crowder hoist can begin raising the assembly.

False Weir/Splitter Gate

The purpose of the false weir, located at the end of the crowding channel is to attract adult fish to volitionally exit the crowding channel into the EA system. The false weir assembly consists of supply upwells within a fabricated aluminum box, with the opening located on west wall of the crowding channel. Fish jump at the water flowing from the false weir, which passes through a curved wedge wire screen. After passing over the high point on the weir, fish slide down a constant 15 percent slope through the splitter gate and into the EA baskets. This slope is wetted with a spray water system from the high point on the top of the false weir to through the splitter gate to the EA baskets. The false weir has a design flow range from 200 gpm to 2,250 gpm, and has the flexibility to control the flow at the discretion of operator. The fabricated aluminum box is divided into two sections, a low flow upper section, and a high flow lower section. The upper section supplies from 200 gpm to 500 gpm to the high point of the false weir. This water supply flows vertically through a curved screen, spilling flow toward the crowding channel. Adjustable flow vanes are positioned in the false weir box to direct flow vertically through the screen. The lower flow section supplies flow in a more horizontal direction through screens, resulting in a concentrated jet of water entering above and below the crowding channel water surface. The design intent for the false weir assembly is to permit the flexibility to adjust to the most effective balance of flow. Once adjusted, the flow should not have to be adjusted again. Actuators are located adjacent to the false weir assembly for operation of the control valves. The switch (splitter) gate is located downstream of the false weir. This is essentially a rubber, large diameter, pipe operated by a hydraulic or pneumatic ram that pushes the pipe from right to left horizontally. The gate will be controlled by the operator of the EA system to guide fish from one basket to the other.

Electro-Anesthesia

The electro-anesthesia (EA) assembly consists of two baskets that are submerged into tanks of water. The purpose of the EA system is to put fish under anesthesia for a short period of time to allow manual sorting and handling. Adult fall Chinook are large active fish, and when under anesthesia they become docile, minimizing injury to the fish and the persons trying to handle the fish. Electric current is applied through the tanks in two stages, initially at a low voltage for a short burst (20 to 30 seconds), then a longer burst (30 to 60 seconds) at a higher voltage. The rate at which the voltage is applied and effective is site specific, and varies with the size of fish, conductivity of the water, and operator preferences. Fish pass over the false weir and are diverted by the splitter gate into one of the two baskets. The splitter gate is controlled by the EA unit operator, who controls the operation of the diversion gate, and the flow of fish to the baskets based on the capacity. Each 45 cf basket/tank can anesthetize roughly 20 adult fall Chinook salmon. The electro-anesthesia baskets measure approximately 5 feet by 3 feet and have a water depth of 3 feet. With the dual basket system, fish can be loaded, anesthetized, and moved onto the sorting table at approximately 2.5 minutes per cycle. In an 8 hour period, if operated continuously, 3,840 fish could be handled and sorted. The electro-anesthesia baskets are equipped with a hoist system that lifts each basket of fully anesthetized fish up to the sorting table. Each basket has a hinged door panel that opens and spills fish on to the sorting table. The total lift of the basket is 19-feet vertically from the filling position to the top position where fish are loaded onto the sorting table.

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Sorting and Spawning Facility

The primary function of the sorting facility is to sort, evaluate, organize, and distribute the adult salmon returning to the I-182 facility. After fish are lifted out of the EA tanks, they are passed on to a stainless steel table for sorting by species and gender, then evaluated for maturity and program need, then distributed through a flume system to the river, to the holding ponds, or to surplus. The purpose of the sorting table is to quickly distribute the anesthetized fish as soon as possible through sorting tubes mounted along the outside edge of the sorting table. The sorting table is brushed stainless steel, with a rolled edge to prevent fish from falling to the floor. Fish slide from the EA baskets into the adjacent 4-foot wide top section of the table, through a transition to the 2-foot wide section, then onto the table. The funnel shaped ramp provides a transition from the EA baskets exit (4 feet wide) to the 2-foot wide sorting table. The table stands 36 inches high from the floor on the EA basket end and slopes down to 32 inches high on the opposite end of the table. It is a u-shape with three rectangular entrances to the sorting flumes positioned along the east side of the table, and four surplus flumes extending off the northwest side of the table. The first flume entrance leads to the recovery tank and adult return to river pipeline. The second two entrances are for the pond return tubes. The surplus tubes are located past the coded wire tag (CWT) reader and the fish stunner on the northwest leg of the table.

The south leg of the u-shaped table is where spawning occurs. A removable UHMW panel is inserted across the sorting table to direct fish to be spawned to that section of the table during spawning. Rectangular to circular transitions are fabricated into the tables backsplash, each with flange that will meet with the flanged end of the flume. Each flume is wetted to facilitate smooth fish transport along the flumes.

Recovery Tank and Adult Return to River Pipe

The purpose of the recovery tank is to hold fish long enough to recover from the effects of anesthesia before returning to the river. The recovery tank is located adjacent to southwest corner of the adult pond. The recovery tank consists of two components; the recovery tank and the return pipe supply structure. The tank is 10 feet long, 10 feet wide, and has 8 feet of water depth, for a total holding volume of 800 cf. At a short-term holding density of 0.25 cf/lb, and assuming a 20 lb fish weight, the tank can hold about 160 fish. Fish slide in a pipeline from the sorting table to the tank, entering on the south side of the tank. Fish exit the tank through a false weir located on the east wall. Some fish may pass out of the tank and into the fish return flume volitionally, however a vertical crowder/brail is provided to force fish into the return channel if necessary. There are two flow supply pipelines, one high flow and the other low flow combined for a minimum 200 gpm and maximum of 5 cfs attraction flow. The recovery tank water surface is controlled by a 6-foot long adjustable weir located on the east wall of the tank, common to the return pipe supply structure. False weir flow that supplies the recovery tank passes through an opening in the interior wall of the tank located below the vertical crowder brail. From there it passes up to and over the adjustable weir and into the return pipe structure, located behind the false weir assembly. In addition to the 5 cfs flow passing from the recovery tank, an additional 3 cfs is supplied to the transition supply structure, for a total of 8 cfs to the adult return pipe.

The transition structure is designed to introduce flow to the adult return pipeline with a minimal amount of turbulence, and pass fish to that flow with minimal stress. It is triangularly shaped starting at 8 feet and narrowing to 18 inches, with a floor that ramps up 2 feet 3 inches vertically in 14 feet. Water that passes over the adjustable weir spills into the 2-foot long energy dissipation section of the structure, with a starting velocity of 0.33 fps for the 8 cfs design flow. The 8 cfs includes the 5 cfs passing over the weir from the recovery tank, and the 3 cfs introduced into the transition. The final velocity at 8 fps of the supply flow through the transition meets the return pipe design velocity of 8 fps.

Fish pass through a separate fabricated flume a distance of approximately 24 feet, beginning at

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the top of the false weir and ending at the beginning of the return pipe. The flume has three sections; the false weir, the rectangular to circular transition, and the circular screen. The 3-foot false weir section dewaters the excess attraction flow. It is a rectangular shaped section with a screened floor for the dewatered flow to drain with a 15 percent slope. The next section is the fabricated aluminum transition from the rectangular section to the circular pipe, occurring in the next 11 feet, also with a 15 percent slope. The final section is a 10 feet long cylindrical screen constructed of stainless steel wedge wire with the smooth side of the wedge facing inward. The inside diameter of the screen matches the 18.3 inch inside diameter of the return pipeline. This section has a slightly flatter slope (12 percent) than the previous section, but steeper than the return pipeline (2.5 percent). The entire section is wetted with a spray water system. Fish will enter the pipe flow with the circular screen section for transport to the river through the return pipe.

The purpose of the Adult Return to River Pipe is to provide the most direct return of the not targeted species of fish not destined for sorting and egg take back to the Yakima River. The pipe exit is located upstream from the entrance. The flume exit is located approximately 100 feet upstream of the lower ladder entrance. Downstream of the false weir, within the transition structure, the 18-inch river return pipe is supplied with 8 cfs. The Adult Return to River Pipe is a 20-inch diameter pipe fed by flow controlled by the transition structure. The flume transport is continuous open channel flow (8.0 cfs) throughout its length. Flow depth in the flume is 9.1 inches (50 percent of the inside diameter of the pipe) and the flow velocity is 8.8 feet/second. The total time required for a fish to pass through the 528 feet pipeline is 60.1 seconds.

5.2) Fish transportation equipment.

Listed UCR adult steelhead, when identified in the Ringold trap, in the past were transported approximately four miles upstream of the Ringold Springs area utilizing the 800 gallon tanker and released. With the new facility upgrades they will be returned to the river via an adult return pipe.

Table 5.2.1: Vehicles Available at Ringold Springs Hatchery for Transport.

Equipment Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Norm. Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Tanker Truck- Adult Transfer (Upriver)	800	Y	N	15		
Tanker Truck	1500	Y	N			

5.3) Broodstock holding and spawning facilities.

Ringold Facility: The dual-use ponds are large concrete vessels designed to function as holding ponds for adult fish and rearing ponds for juvenile fish. The six rectangular concrete ponds are located adjacent to the sorting facility oriented in a north/south direction and aligned symmetrically with the sorting table and transfer flumes. The components of the dual use adult holding ponds are the drain structure, the pond crowders, the crowder transfer carriage, the end channel crowder, the upwell supply system, and the drain/water level control system.

The ponds measure 200 feet in length, 20 feet in width, and have an average water depth of 8 feet. The total holding volume per pond is 32,000 cf. At the long term holding density criteria of 0.50 cf/lb, and a fish size of 20 lbs, each pond can hold 3,200 returning adults. Each pond is supplied with a maximum of 10 cfs through an up well located in base of the crowding channel at the south end of each. The ponds have been designed to enable switching operation between adult holding and rearing.

I-182 Acclimation Site: The dual-use ponds are large concrete vessels designed to function as holding ponds for adult fish and rearing ponds for juvenile fish. There are two rectangular concrete ponds located on the site oriented in an east/west direction and aligned perpendicular to the river. The components of the dual use adult holding ponds are the pond crowders, the end channel crowder, the upwell supply system, and the drain channel/water level control system.

The ponds measure 200 feet in length, 20 feet in width, and have an average water depth of 8 feet with 5 feet of freeboard. The total holding volume per pond is 32,000 cf. At the long term holding density criteria of 0.50 cf/lb, and a fish size of 20 lbs, each pond can hold 3,200 returning adults. The short-term criteria for holding are 0.25 lbs/cf, which results in a 6,400 fish capacity. The following table shows predicted adult return numbers to the acclimation facility for both yearlings and sub-yearlings. A pond spray system is provided to calm fish and minimize jumping. Each pond is supplied with a maximum of 10 cfs through an up well located in base of the crowding channel at the west end of each. The ponds have been designed to enable switching operation between adult holding and rearing. This is possible because the design is based on a sub-yearling and yearling program that has no overlap in adult holding and juvenile rearing requirements.

5.4) Incubation facilities.

Ringold Facility:

The Incubation Building is 140 feet 0 inches by 80 feet 0 inches and encloses the incubation facilities and staff use areas. The incubation area is 120 feet 0 inches by 60 feet 0 inches and has room for the incubation stacks and troughs. The incubation room houses the vertical stack incubators and associated water supply and drain infrastructure. The assumed egg take is estimated to be approximately 17.3 M. Assuming a 90 percent survival, this will provide fish to meet the 13.8 M initial production for both Ringold and the I-182 acclimation site. There are 180 16-tray vertical stack incubators organized into six rows of 30 stacks. Each vertical stack can be loaded with 96,000 fertilized eggs (6,000 per tray). The incubators require a maximum total flow of 1800 gpm. The rows of stacks are paired into three separate groups with 10 feet of clearance between. Water supply for each group is delivered via an overhead manifold system. A common supply pipe provides flow to each of the three supply trough positions over the stacks. The supply trough is fabricated stainless steel, rectangular in cross sectional area, 18 inches wide by 18 inches wide. The water surface in each pond is controlled by a removable weir positioned at the drain end of each trough. Flow is provided to the top and bottom 8 of each of the 16 stacks through 1-inch PVC piping with valve control on each. A floor drain system is in place below each group of tray stacks, and also in the open area of the incubation room.

Table 5.4.1: Incubation Criteria per Tetra Tech DDR 2014.

Criteria	Design Value	Source	Notes
Loading of 16-tray Vertical Incubation Stacks	96,000 eggs per stack	WDFW comments on 60% DDR	Consistent with loadings of similar units at other hatcheries.
Flow per 16-Tray Vertical Incubation Stack	10 gpm	Senn, 1984	Consistent with flows used in similar units at other hatcheries.
Water Temperature	48-50 °F	WDFW, Senn, 1984	
Assumed Egg Survival to Hatching	90 percent		Assumption based on values seen at other modern hatcheries.

5.5) Rearing facilities.

Ringold Facility:

The dual use ponds are used for juvenile rearing in addition to adult holding. In the juvenile rearing mode, the ponds are empty until fish are moved from the raceways after marking. The total 32,000 cf of each pond volume will be used for rearing. This volume will allow 1,296,000 fish to be grown to release at 50 FPP, which is the equivalent to the number of fish in 2.5 raceways when fish are marked and transferred to the large ponds at 200 FPP. The large ponds have the capacity to rear 7.8 M of the 10.4 M to release size at 50 FPP. The difference (2.6 M) will be reared to release size in the raceways, of which 13 of the 30 raceways would suffice. The main components of the rearing ponds are the inlet structure, shade structure, predation netting, intermediate divider screens, and the outlet/water level control structure. In the rearing mode, the ponds measure 200 feet long between the inlet and outlet screens, 20 feet wide, with an average water depth of 8 feet.

The initial juvenile rearing ponds are placed close to the hatchery building, providing close proximity of incubation to rearing stages in the growth process of juvenile salmon. Fish are placed in the ponds shortly after incubation, and are grown in the ponds to a predetermined size for marking at 200 FPP. Rectangular cast-in- place concrete ponds are provided based on the WDFW style standard 10 feet by 100 feet WDFW standard concrete raceways. The dimensions of the usable portion of each rearing pond are 10 feet wide by 100 feet long, with an average depth of 5 feet, resulting in a 5,000 cubic foot volume. There is 1.0 feet of freeboard in the pond, with a 6-inch curb from the access road finish grade to the top of wall. Each pond floor is sloped 1 foot vertically over the length of the pond so that it can be completely drained when not in use. There are a total of 30 rearing ponds in five groups of six. The total volume of the 30 ponds will be 150,000 cubic feet. Each pond has the volume capacity to grow 504,000 fish to 200 FPP.

The pond pairs are covered with a fixed roof supported by a structural steel framework. The Ringold facility is situated in a dry sunny semi-arid climate, where temperatures are quite high during the summer months. The roof structure will provide shade for rearing during this time period, and will help to minimize higher water temperatures in the ponds due to direct sun exposure. The roof structure also is part of the predation control system . Bird predation is a major concern and impact to fish loss at the existing Ringold ponds. In addition to providing shade, the roof structure will also provide protection from bird predation. Bird netting will be attached vertically from the roof forming an enclosure that prevents birds and other predators

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from access to the fish in the ponds. The netting will be designed in separate panels and staff will have the ability to raise and lower the netting panels to allow for pond vacuuming, feeding, and other access needs.

Table 5.5.1: Rearing Criteria per Tetra Tech DDR 2014.

Criteria	Design Value	Source	Notes
Rearing Density Index	0.2 lbs/cf/in	WDFW Fish Health	Comments on 60%DDR
Pond Flow Index	1.4 lb/gpm/in	WDFW Fish Health Senn, 1984	This value is consistent with what is in use at Little White Salmon
Fish Size at Marking/Transport	200 FPP 2.52 inches	WDFW Piper	
Pond Density at marking	0.504 lbs/cf		Calculated value
Pond Flow at marking	3.528 lbs/gpm		Calculated value
Fish Size at Release	50 FPP 4.05 inches	WDFW Piper	
Pond Density release	0.81 lbs/cf		Calculated value
Pond Flow at release	5.67 lbs/gpm		Calculated value

<u>I-182 Acclimation Site:</u>

The dual use ponds are used for juvenile rearing in addition to adult holding as previously described. In the juvenile rearing mode, the ponds are empty until fish are moved from the either the Ringold Hatchery or the Bonneville Hatchery after marking. The total 32,000 cubic feet of each pond volume will be used for rearing. This volume will allow acclimation and release of 2,000,000 sub yearling fish transported from Ringold at 50fpp. The main components of the rearing ponds are the inlet structure, shade structure, predation netting, intermediate divider screens, and the outlet/water level control structure.

In the rearing mode, the ponds measure 200 feet long between the inlet and outlet screens, 20 feet wide, with an average water depth of 8 feet. The ponds are covered with a roof structure that will provide shade. Net panels will hang from the roof along the sides of the ponds for exclusion of birds and other fish predators.

5.6) Acclimation/release facilities.

<u>Ringold Facility:</u> Fish will be acclimated and imprinted at Ringold Springs. Fish will be reared on a combination of well water, spring water and pumped river water and released from these ponds into Ringold Springs Creek at CrM 0.125 which flows into the Columbia River at RM 354.9.

The outlet structure is enclosed by screens and walkway grating, supported by a stainless steel structure. There are three screen cells, each housing two 3-foot high by 3-foot 4-inch wide screens. The screens are removed manually. At the downstream end of the ponds, the depth of water is 5.5 feet through the screens, and the screens have the same porosity as the inlet screens (3/32-in slot/hole maximum size, with a minimum 40 percent open area). Flow/water surface control in the ponds is accomplished by the use of 2-inch by 6-inch wooden (fir or redwood) tongue-in-groove stoplogs placed in guides downstream of the screen panels. Stoplogs are stacked within the guides on top of a concrete stem wall, which extends across two of the three screen/stoplog cells. In addition to the stoplogs, the water surface in the ponds can be adjusted more precisely by the pivoting standpipe located one cell to the right of the full height stoplog cell. The pivoting standpipe assembly consists of a 12-inch diameter pipe with a 90-degree elbow designed to rotate about a penetration through the wall. In rearing mode, the adjustable standpipe is used for release for fish. This provides flexibility in the ease of moving fish out of the pond during release. Screens are removed in the section adjacent to the standpipe inlet, and fish are free to move out of the pond volitionally. The standpipe is designed to lower the water surface in the pond gradually without requiring manipulation of stoplogs. A manual weir gate is positioned in the drain channel close to the entrance of the drainpipe to maintain water depth in the channel. The water in the channel will act as a cushion for fish moving out of the channel when the standpipe outlet is adjusted at higher levels preventing stress and injury from impact in the drain channel. Fish are released to a common drain-piping network, which combines to a single pipeline that discharges to the creek upstream of the upper ladder entrance.

<u>I-182 Acclimation Facility:</u>
In rearing mode, the adjustable standpipe is used for release for fish. Screens are removed in the section adjacent to the standpipe inlet, and fish are free to move out of the pond volitionally. The standpipe is designed to lower the water surface in the pond gradually without requiring manipulation of stoplogs. A manual weir gate is positioned in the drain channel close to the entrance of the drain pipe to maintain water depth in the channel. The water in the channel will act as a cushion for fish moving out of the channel when the standpipe outlet is adjusted at higher levels preventing stress and injury from impact in the drain channel.
The proposed water supply for the acclimation facilities would be an intake screen and pump station drawing flow from the Yakima River. River temperatures will most likely follow Columbia River trends, and be favorable for rearing in January through May when fish would be in the ponds onsite. Returning adults will not be held in the long term, and will most likely be surplused; therefore, the higher river water temperatures in the fall would not be an issue. The intake will consist of a submerged cone screen and pump station designed to meet NOAA Fisheries Guidelines and Criteria, sized to supply a maximum flow of 30 cfs. A new water right will be required.

5.7) Describe operational difficulties or disasters that led to significant fish mortality.

<u>Ringold Facility:</u> In the past heavy bird predation in the rearing pond at Ringold was significant (believed by RSH hatchery staff to be as high as 30% in one year). During the 2002 release year, it was estimated that herons and gulls consumed about 1.25 million smolts from the 9-acre rearing pond. Continued losses of this magnitude on an annual basis would greatly affect adult returns and make it difficult to achieve the required proportion of the John Day mitigation goal at this facility (Bumgarner 2008).

In 2007, shortly after delivery from Bonneville, the facility experienced an outbreak of botulism that resulted in 100% mortality. The facility has initiated operational changes such as discing the soil repeatedly between brood years that should help prevent a reoccurrence. Rebuild of Ringold Springs Hatchery to a state-of-the-art facility with concrete rearing ponds and bird exclusion netting will eliminate avian predation.

5.8) Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

Listed fish are not directly involved in the URB rearing program. Risk aversions for facility impacts would include:

- The facility is continuously staffed 24 hours a day to assure the safe operations of the facility.
- If the main river pump use is permitted by WA Dept. of Ecology, flow volume is monitored. The barrel screen is inspected as needed when extreme river flow conditions or operational problems suggest damage to the screen openings.
- Adult trapping, protocols include daily inspection and regular monitoring of trapped adults. Listed fish or fall Chinook with adipose fin present that are not needed for natural stock integration into the broodstock are returned back to stream quickly.
- Backup generators to provide an alternative source of power during outages.
- Protocols in place to test standby generators and all alarm systems on a routine basis.
- Alarm systems installed and operating to detect water supply failures in rearing vessels.
- Densities at approved criteria to reduce risk of loss to disease.
- Roofing and netting will be installed around rearing ponds to eliminate/minimize losses due to predation.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1) Source.

Broodstock used in the program will be collected from the run-at-large volunteering to the Ringold Springs adult trap, with the addition of natural-origin broodstock (adipose fin intact) collected by volunteer anglers to achieve 30% natural origin broodstock objective, as needed. Beginning in BY2008, fall Chinook salmon returns to Priest Rapids Hatchery has been used as broodstock for the RSH fall Chinook production. The Hanford Reach /PRH URB broodstock was selected by co-managers in 2008 because it is the local, native broodstock rather than continuing to use Bonneville Hatchery URB's. Currently, PRH and the OLAFT Trap serves as a broodstock collection locations for both PRH and RSH. Should there not be adequate returns to Ringold to meet program goals, it would be possible to rely on adults returning to PRH, OLAFT Trap or the I-182 Acclimation Site.

6.2) Supporting information.

6.2.1) History.

Ringold Springs Hatchery does not currently have facilities capable of incubating salmon or steelhead eggs. From brood year 1993 through 2007, fall Chinook released at RSH originated from broodstock collected at ODFW's Bonneville Hatchery. In 2008, Priest Rapids Hatchery/Hanford Reach URB broodstock was selected by co-managers as broodstock for the program because it is the local, native broodstock rather than continuing to use Bonneville Hatchery URB's.

6.2.2) Annual size.

The current annual broodstock collection goal for the Ringold program is 6,300. These numbers include a 1:2 male/female sex ratio and a 10% pre-spawn mortality.

The current collection goal of up to 2,000 natural origin fall Chinook for use as broodstock is not expected to adversely affect the population status of the natural population which has averaged over 61,000 adults (2004-2013). Target broodstock composition is 70% hatchery origin and 30% natural origin. **See Section 6.2.3**.

6.2.3) Past and proposed level of natural fish in broodstock.

As stated in Section 6.2.1, prior to 2008 all egg takes for the Ringold fall Chinook production were collected at Bonneville Hatchery and it was unlikely that any natural-origin fall Chinook were included in the broodstock.

Since 2008, broodstock collection for Ringold production has occurred at Priest Rapids Hatchery. Priest Rapids has a target of incorporating 30% natural origin fish in the broodstock. In 2007, Priest Rapids Hatchery began annually otolith marking all releases, however, not all of the fish released are externally marked or otherwise tagged. Natural origin fall Chinook are incorporated into the broodstock at Priest Rapids Hatchery from collections at the volunteer trap, the Off Ladder Adult Fish Trap at Priest Rapids Dam, and the Angler Broodstock Program.

The proportion of natural-origin broodstock (pNOB) can only be accurately estimated for adult returns years 2012 and 2013 at Priest Rapids Hatchery using a combination of otolith sampling, mark observations, and CWT detections. The proportion of natural origin fall Chinook collected from the volunteer trap was 0.057 in 2012 and 0.018 in 2013.

Over the past four years 1,886 adult fall Chinook have been collected at the OLAFT and transported to PRH to be used for broodstock. Roughly 54% of the fish collected to date have been natural-origin. Each year the broodstock collection protocols have been modified in an attempt to increase the proportion of natural origin fall Chinook of fish selected at the site. In 2013, 780 fall Chinook were transported to PRH, 658 of these were spawned at PRH and 55% (357) were natural origin.

The Angler Broodstock Collection project was started in 2012 as a three-year pilot project to determine if natural-origin broodstock could be effectively collected by anglers. In 2012, the first year, only 70 fish were captured during this program but 91% of the fish captured were natural-origin and there was very little mortality in the field or at the hatchery (holding). In 2013, 402 unclipped fall Chinook were captured, 307 fish were spawned and 81% of the fish spawned were natural-origin.

The proportion of natural origin broodstock at Priest Rapids Hatchery was estimated at 0.128 in 2013(**Table 6.2.3.1)**. The use of the OLAFT and the ABC programs increased pNOB from 0.018 to 0.128. The broodstock was comprised of 4,476 fish from the PRH volunteer trap, 658 from the OLAFT and 307 fish from the ABC program. pNOB in 2012 was similar but slightly lower at 0.119.

Table 6.2.3.1: Proportion of naturally produced Chinook salmon in the Priest Rapids Hatchery broodstock (pNOB) based on otolith marks, in-sample coded-wire tags, and adipose clips, 2012 and 2013.

Return	**Volunteer Trap**			**OLAFT**			**ABC**			Combined
Year	NOR	HOR	pNOB	NOR	HOR	pNOB	NOR	HOR	pNOB	pNOB
2012	252	4,156	0.057	281	220	0.561	59	6	0.908	0.119
2013	82	4,394	0.018	367	291	0.558	248	59	0.808	0.128
Mean	**167**	**4,275**	**0.038**	**324**	**256**	**0.559**	**154**	**33**	**0.858**	**0.124**

Source: Paul Hoffarth, WDFW 2014.

Although uncertainties regarding the historical pNOB exist, co-managers have a target to incorporate 30% natural-origin fish in the broodstock. Co-managers will continue to evaluate marking and tagging options available that when implemented will result in real-time, positive identification of hatchery-origin adults within the adults collected for broodstock. This will also play a role in determining the number of hatchery-origin adults on the spawning grounds in the Hanford Reach.

Over the most recent 15 years, 9.2% of the naturally spawning population of the Hanford Reach has been comprised of hatchery-origin Chinook, primarily from Priest Rapids and Ringold Springs Hatcheries (**Table 6.2.1**).

Table 6.2.1: Composition of hatchery and natural origin fall Chinook recovered on the spawning grounds in the Hanford Reach based on coded wire tag (CWT) analysis, 1997-2013.

Year	**Hanford Reach Escapement**	**Hatchery Origin (% of escapement)**	Natural

	Adult	Jack	Total	Priest	Ringold	Other	Total	Origin
1997	34,007	9,486	43,493	8.6%	3.4%	1.4%	13.4%	86.6%
1998	29,410	5,983	35,393	2.3%	2.0%	1.2%	5.5%	94.5%
1999	27,012	2,800	29,812	14.0%	2.2%	1.2%	17.4%	82.6%
2000	36,027	11,993	48,020	15.9%	6.8%	2.0%	24.7%	75.3%
2001	44,140	15,708	59,848	3.3%	2.2%	0.6%	6.2%	93.8%
2002	69,342	15,167	84,509	6.4%	1.2%	0.7%	8.3%	91.7%
2003	89,312	11,196	100,508	5.7%	2.1%	1.4%	9.2%	90.8%
2004	79,464	8,231	87,696	6.8%	1.4%	0.1%	8.4%	91.6%
2005	64,355	7,612	71,967	9.2%	1.0%	0.2%	10.4%	89.6%
2006	47,095	4,606	51,701	4.5%	0.9%	0.4%	5.8%	94.2%
2007	13,887	8,385	22,272	3.9%	0.0%	0.3%	4.1%	95.9%
2008	23,361	5,697	29,058	4.4%	0.0%	0.2%	4.6%	95.4%
2009	26,346	10,374	36,720	6.5%	0.5%	0.7%	7.7%	92.3%
2010	80,408	6,608	87,016	2.7%	1.3%	0.1%	4.0%	96.0%
2011	65,724	9,532	75,256	4.2%	2.8%	0.5%	7.6%	92.4%
2012	**51,774**	**5,857**	**57,631**	**4.5%**	**2.4%**	**0.6%**	**7.4%**	**92.6%**
2013	**157,294**	**17,356**	**174,650**	**16.5%**	**4.1%**	**1.1%**	**21.7%**	**78.3%**
Mean	**48,659**	**8,892**	**57,551**	**6.6%**	**1.9%**	**0.7%**	**9.2%**	**90.8%**

Source: Paul Hoffarth, District 4 WDFW Biologist.

6.2.4) Genetic or ecological differences.

There are no known genotypic, phenotypic, or behavioral differences between the hatchery fall Chinook salmon stock and natural fall Chinook salmon stocks within the Upper Columbia summer/fall Chinook salmon ESU. The monitoring and evaluation program will continue to monitor the genotypic, phenotypic, or behavioral traits. See also **HGMP Sections 7.3 and Section 11**.

6.2.5) Reasons for choosing.

This broodstock represents the indigenous Hanford Reach population, which beginning with brood year 2008 has been the brood stock for the existing John Day Mitigation program at RSH.

6.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

The choice of broodstock origin of unlisted Columbia River fall Chinook salmon is not expected to impact listed natural populations.

SECTION 7. BROODSTOCK COLLECTION

7.1) Life-history stage to be collected (adults, eggs, or juveniles).

Broodstock adults will be collected at Ringold Springs and from returns to the I-182 Acclimation Site. It may also be necessary to collect and transport adults from the Priest Rapids Hatchery, the OLAFT, or from the Hanford Reach natural-origin population to Ringold Springs. **See also Priest Rapids Hatchery Fall Chinook HGMP**. Additional collections, using live capture gear, may occur in the Columbia River to increase natural origin broodstock.

7.2) Collection or sampling design.

Ringold Facility:

Adults are collected throughout the entire run to ensure that the run timing for this population is maintained.

Broodstock Collection at the <u>I-182 Acclimation Site:</u>

Adults are collected throughout the entire run to ensure that the run timing for this population is maintained.

Adult broodstock collection at Priest Rapids Hatchery is described in the **Priest Rapids Hatchery HGMP**. Facility trapping operations at the Off Ladder Adult Fish Trap (OLAFT) located at Priest Rapids Dam is described in 2012 OLAFT SOW.

7.3) Identity.

Columbia URB stock is defined as wild and hatchery fall Chinook salmon originating upstream of McNary Dam. This population is included as part of the Upper Columbia Summer/Fall Chinook salmon ESU (Myers et al. 1998). The hatchery-origin fish are genetically indistinguishable from other URB fall Chinook salmon populations present in the project area during the September-November broodstock collection period (Waknitz et al. 1995; Myers et al. 1998). Strays from other hatcheries have a minimal impact on the Priest Rapids Hatchery broodstock. Strays from other hatcheries (excluding Ringold Springs) comprise less than 1% of the return to the hatchery volunteer trap. Between 1997 and 2013, out-of-basin strays have comprised 0.5% of the hatchery return and the broodstock, range 0.0% - 1.3%.

7.4) Proposed number to be collected:

7.4.1) Program goal:

The estimated maximum number of adults required for Ringold Springs broodstock will be 6,300 to produce 14.65 million smolts at RSH for on-site and off-site (I-182) release at a 1:2 male to female sex ratio.

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:

All adults are collected at Priest Rapids Hatchery. **See Priest Rapids Fall Chinook HGMP, Section 7.4.2.1.**

Table 7.4.2.1: Adults collected and surplused at Ringold Springs from 2006 – 2013.

Return Year	Females		Males		Jacks		Total
		Ratio		Ratio		Ratio	
2006	39		78		1		118
2007	11		18		0		29
2008	0		0		0		0
2009	27		78		1,410		1,515
2010	1,678		5,966		1,305		8,946
2011	2,779		2,855		1,289		6,923
2012	1,466		3,858		2,067		7,391
2013	11,709		4,728		530		16,967
Average	**756**		**1,500**		**825**		**4,912**

Data Source: WDFW Hatcheries Headquarters Database 2014.

7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.

Currently all surplus fish at Ringold Spring Hatchery are donated to food banks if in good condition, or disposed of at landfill if in poor condition.

The proposed program at Ringold will require the use of returning adults as broodstock. Spawned carcasses will be disposed of through a WDFW contracted fish buyer.

7.6) Fish transportation and holding methods.

It may become necessary to haul adult fish from the I-182 Acclimation Site, Priest Rapids Hatchery, the OLAFT Trap or angling for brood stock purposes. In these cases, RSH has a 1,500 gallon fish transport vehicle capable of hauling adult fish. Fish will be ponded at RSH in the new dual use ponds.

All fish reared at Ringold for on-site release will be released into Spring Creek. Non-target adult wild fish will be returned to Columbia River via the return transport pipe.

Table 7.6.1: Equipment Available for Transport at the Ringold Facility.

Equipment Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Norm. Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Tanker Truck- Adult	800	Y	N	15		
Tanker Truck	1500	Y	N			

7.7) Describe fish health maintenance and sanitation procedures applied.

(**See also Priest Rapids Hatchery HGMP**.) Early-arriving adults selected for spawning at Ringold will be injected with Liquamycin (LA-200), prior to transfer to holding ponds. The injection dose was 0.5 cc per 10 lbs. of fish. Total use of Liquamycin was 900 milliliters for the season. This treatment was for the prevention of *Columnaris* and *Furunculosis*.

Formalin treatments on adults will be at a rate of 1:6000 every day, starting the first day of ponding. Formalin on adults is used to prevent fungus.

7.8) Disposition of carcasses.

<u>Ringold Springs Hatchery and I-182 Acclimation Site:</u> If not needed for program, surplus fish can be donated or disposed. Fish will be donated to food banks if in good condition, or disposed of using WDFW's contracted fish buyer.

7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

The traps are checked daily and any none target or listed fish present are released via the Adult Return Pipe to the mainstem Columbia River from the Ringold facility, or the Yakima River from the I-182 Acclimation Site.

<u>SECTION 8. MATING</u>

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

8.1) Selection method.

Spawners are selected and mated randomly from the population maintained in the hatchery holding ponds. Fish are spawned throughout the entire run to help ensure that the run timing for the stock is maintained.

8.2) Males.

Jacks will be collected and spawned at a rate of up to 2%. Since 2002, 35% of all spawners have been males (**See Section 7.4.2**).

8.3) Fertilization.

For daily egg takes under 500,000, eggs from two females are spawned into a bucket, and two males are then spawned into the combined eggs. For daily egg takes greater than 500,000, eggs from two females are spawned into one bucket and milt from one male is introduced. These eggs are then combined with eggs spawned from two other females and also fertilized with one male, so that a single bucket contains eggs from four females. This procedure equates to a 1 male to 2 female ratio, but provides for back-up fertilization for the combined eggs if milt used from one of the males in the pooled buckets proves to be non-viable.

Fish health procedures used for disease prevention include water hardening of eggs in an iodophor solution at spawning and biological sampling of spawners.

8.4) Cryopreserved gametes.

Cryopreserved gametes are not used.

8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

The population being reared, UCR fall Chinook salmon, are not ESA-listed. Listed wild fish from other populations/stocks are not intentionally taken for broodstock in this hatchery program; therefore they should not be affected by mating procedures.

SECTION 9. INCUBATION AND REARING -

Specify any management *goals* (e.g. "egg to smolt survival") that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.

9.1) Incubation:

9.1.1) Number of eggs taken and survival rates to eye-up and/or ponding.

In order to meet the future smolt, fry, and egg production goals of the Ringold Springs fall Chinook program, the green egg take requirement will be 16,300,000.

Female fecundity averaged 4,220 for the period 2004 to 2009.

See also **Priest Rapids Hatchery HGMP**.

9.1.2) Cause for, and disposition of surplus egg takes.

The Program may take up to 10% surplus green eggs. The number of surplus eyed eggs will be based on program performance. In the event surplus eyed eggs exist, the WDFW will make a decision as to their best use. Surpluses will be culled from the population in a manner consistent with achieving program goals and WDFW policy.

See also **Priest Rapids Hatchery HGMP**.

9.1.3) Loading densities applied during incubation.

See Section 5.4 for details regarding loading densities during incubation.

9.1.4) Incubation conditions.

See Section 5.4 for details regarding incubation conditions.

9.1.5) Ponding.

9.1.6) Fish health maintenance and monitoring.

Eggs at Ringold will be treated using a drip treatment at 1:600 for 15 minutes on a daily basis. Formalin is used on eggs to prevent fungus and "soft shell".

Staff at Ringold conducts daily inspection, visual monitoring and sampling of sub-yearling fish. As soon as potential problems are seen, these concerns are immediately communicated to the WDFW Fish Health Specialist. In regular monitoring, fish health specialists conduct inspections monthly. Potential problems are managed promptly to limit mortality and reduce possible disease transmission.

9.1.7) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

Not applicable - listed wild fish are not intentionally taken for broodstock in this hatchery program. **See also Priest Rapids Hatchery HGMP**.

9.2) Rearing:

9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to sub-yearling; sub-yearling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available.

9.2.2) Density and loading criteria (*goals and actual levels*).

Fish at Ringold Springs will be reared in a combination of intermediate raceways and rearing ponds at 0.8 lbs. of fish per ft^3. The flow index being used for design criteria is 1.4.

9.2.3) Fish rearing conditions

See **HGMP Section 5.5** for more details.

Mortalities are picked daily, and the ponds inspected by pathologists monthly. IHOT standards are followed for: water quality, alarm systems, predator control measures, loading and density to provide the necessary security for the cultured stock. The program uses a diet and growth regime that mimics natural seasonal growth patterns (See **Section 5.5** for specific information regarding loading densities).

9.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.

Prior to the rebuild program fish were only reared and acclimated for 45-60 days at Ringold Springs.

Table 9.2.4.1: Ringold Growth Data Prior to Facility Upgrades.

Rearing Period	Length (mm)	Weight (fpp)	Condition Factor	Growth Rate
February	36.74	1100	unknown	Na
March	50.5	425	unknown	Na
April	66.7	192	unknown	Na
May	69.4	99	1.32	Na
June	88	60	1.18	Na

9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.

See section 9.2.4.

9.2.6) Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).

Feeding rates are followed so that fish size is within 10% of program goal each year. Operator conducts periodic feed quality analysis.

Table 9.2.6.1: Feeding Schedule.

Rearing Period	Food Type	Application Schedule (#feedings/day)	Feeding Rate Range (%B.W./day)	Lbs. Fed Per gpm of Inflow	Food Conversion During Period
May	Bio-Clark Fry #1.2 Medicated	1	1.0	0.0875	0.8
June	Bio- Clark Fry 1.2	1	1. 5	0.1400	0.8
June	Bio Clark Fry 1.5	1	1.5	0.1400	0.7

9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.

IHOT fish health guidelines are followed to prevent disease transmission between lots of fish on site or transmission or amplification to or within the watershed. The juvenile rearing density and loading guidelines used at the facility are based on standardized agency guidelines, life-stage specific survival studies conducted on-site, life-stage specific survival studies conducted at other facilities and staff experience.

9.2.8) Smolt development indices (e.g. gill ATPase activity), if applicable.

The migratory state of the release population is determined by past history including time and size of fish. Behavioral cues such as; loose scales during feeding and swarming behavior are also monitored by staff.

9.2.9) Indicate the use of "natural" rearing methods as applied in the program.

None. The facility will be modified to raceways. No “natural” rearing methods are currently developed for raceway rearing of sub-yearling fall Chinook.

9.2.10) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.

Listed, wild fish are not taken for broodstock in this program; therefore they should not be affected by rearing procedures.

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SECTION 10. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.

10.1) Proposed fish release levels.

Table 10.1: Proposed fish release levels.

Age Class	Max. No.	Size (fpp)	Release Date	Location			
				Stream	Release Point (RKm)	Major Watershed	Eco-province
Sub-yearling	10.4M	50	May-July	Spring Cr (Tributary to Columbia River)	567	Upper Middle Columbia	Columbia Plateau
Sub-yearling	3.75M	50	May-July	Yakima River	7.5	Upper Middle Columbia	Columbia Plateau
Yearling	500K	10	March-April	Yakima River	7.5	Upper Middle Columbia	Columbia Plateau

Note – a combination of yearling and sub-yearling production can be used to meet the total adult production goal for releases at I-182.

10.2) Specific location(s) of proposed release(s).

Stream, river, or watercourse: Spring Creek, tributary to Columbia River
Release point: R.Km 567
Major watershed: Middle/Upper Columbia River
Basin or Region: Middle/Upper Columbia River

See Section 10.1. The outlet of the dual use ponds enters Spring Creek a short distance above the confluence with the Columbia River.

Specific location(s) of proposed release(s).
Stream, river, or watercourse: Yakima River, tributary to Columbia River
Release point: R K.m 7.5
Major watershed: Middle/Upper Columbia River
Basin or Region: Middle/Upper Columbia River

10.3) Actual numbers and sizes of fish released by age class through the program.

Table 10.3.1: Release Numbers from Ringold Springs Facility 1998-2012.

Release Year	Sub-yearling Release		
	No.	Date (MM/DD)	Avg Size (fpp)
1998	3,491,207	June 24-27	57.5
1999	3,484,000	June 16-22	45.2
2000	3,436,897	June 13-19	46.6
2001	2,974,905	June 18-24	40.8
2002	2,283,020	June 17-24	50.3
2003	3,322,946	June 6-18	58.0
2004	3,007,316	June 14-20	58.5
2005	2,000,855	June 14-16	65.0
2006	69,902	June 1-5	101.0
2007	3,402,530	June 15-22	61.3

2008	3,097,449	June 11-27	57.5
2009	3,507,075	June 8-23	59
2010	3,398,559	June 14-30	56
2011	3,450,000	June 23-30	58
2012	3,328,918	June 27-July 10	58

Source: WDFW FishBooks 2012.

10.4) Actual dates of release and description of release protocols.

Ringold Springs Facility: Fish will be directly released from the dual use ponds to an outlet that joins Spring Creek, which flows to the Columbia River. Releases occur when screens are removed. A significant portion of the population is allowed to emigrate volitionally. This volitional release can take up to two - four weeks with the pond slowly lowered as the population moves out. **See actual date of releases in Section 10.3.**

I-182 Acclimation Site: Yearling and sub-yearling production will be directly released from the dual use ponds to an outlet that flows to the Yakima River. Releases occur when screens are removed. A significant portion of the population is allowed to emigrate volitionally. This volitional release can take up to two - four weeks with the pond slowly lowered as the population moves out. Release date range may vary with the proposed increase in production.

10.5) Fish transportation procedures, if applicable.

Once fish have been marked at Ringold they will be transported to the I-182 Acclimation Site. Transit time will be approximately 1 hour. Fish will be crowded into a fish pump and loaded on the truck for transit. Yearling production will be marked at Bonneville and shipped to I-182 for acclimation.

Table 10.5.1: Transport Vehicles Available at Ringold Springs Facility.

Equipment Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Norm. Transit Time (minutes)
Tanker Truck-	1,500	Y	N	60

10.6) Acclimation procedures.

Ringold Facility: Fish reared for on-station release will be reared on a combination of Ringold Spring water, Columbia River mainstem water and well water distributed from the common water distribution tower.

I-182 Acclimation Site Fish reared for release from the I-182 Acclimation Site will be acclimated for at least 30-45 days on Yakima River water.

10.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

Though only the CWT fall Chinook were originally adipose clipped from Ringold Springs Hatchery, 100% of the release has been adipose clipped since the 2008 release (BY07). The newly proposed program is funded with federal funds which requires the 100% adipose clipping of all hatchery released fish at Ringold and I-182 (See – United States Congress 2003, Consolidated Appropriations Resolution, Sec 138 which mandates visibly marking of all federally funding releases of Chinook, coho and steelhead). Currently it is planned that the entire sub-yearling production will be marked and or tagged at Ringold and then the 3.75M will be transferred to the I-182 acclimation site.

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The current Ringold Springs fall Chinook program is index marked (CWT and adipose clipped). Approximately 200,000 fish (5.7%) are marked, tagged (CWT), and released with the main production group. New expanded production at Ringold Springs and I-182, will be uniquely coded wire tagged to differentiate the contributions of each release site to various fisheries and impacts to local and out of basin systems. Approximately (6.0%) of the Ringold Springs release will be adipose + CWT, 600,000. A total of 600,000 of the 3.75 million fall Chinook released from the I-182 acclimation ponds will be adipose + CWT.

From 1997 through 2000 BY (1998-2001 releases) a small number of the Ringold Springs fall Chinook (3,000) were PIT tagged and released. Annually, 20K PIT tagging smolts from Ringold and 20K smolts released from I-182 will be released to evaluate both juvenile and adult migration timing and timing and survival through the hydro-system. PIT tag arrays in be installed in the ladders at each facility. (**See Appendix 2).**

10.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.

Ringold Hatchery and I-182 Acclimation Site: Numbers of fish reared through the program at RSH are set forth in Annual Brood Document and U.S. vs. Oregon Management Agreement. All fish reared and acclimated at the facility are considered within approved levels; thus juvenile surpluses at the time of release are not expected at this facility.

Department of Fish and Wildlife has limited latitude in disposing of salmon and steelhead eggs/fry/fish. We are implementing specific measures during the different life-history stages to both improve the accuracy of production levels and make adjustments if over-production occurs. These measures include (1) Improved Fecundity Estimates, (2) Adult Collection Adjustments, (3) Within-Hatchery Program Adjustments, and (4) Culling.

Within-Hatchery Program Adjustments
At the eyed egg inventory (first trued inventory), after adjustments have been made for culling to meet BKD management objectives, the over production will be managed in one or more of the following actions:

- Voluntary cooperative salmon culture programs under the supervision of the department under chapter 77.100 RCW;
- Regional fisheries enhancement group salmon culture programs under the supervision of the department under this chapter;
- Salmon culture programs requested by lead entities and approved by the salmon funding recovery board under chapter 77.85 RCW;
- Hatcheries of federally approved tribes in Washington to whom eggs are moved, not sold, under the interlocal cooperation act, chapter 39.34 RCW; and
- Governmental hatcheries in Washington, Oregon, and Idaho; or
- Culling for diseases such as BKD and IHN, consistent with the Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State; or
- Distribution to approved organizations/projects for research.

At tagging (second inventory correction) fish will be tagged up to 110% of production level at that life stage. If the balance of the population combined with the tagged population amounts to more than 110% of the total release number allowed by permits then the excess will be distributed in one or more of the following actions:

- Voluntary cooperative salmon culture programs under the supervision of the department under chapter 77.100 RCW;
- Regional fisheries enhancement group salmon culture programs under the supervision of the department under this chapter;
- Salmon culture programs requested by lead entities and approved by the salmon funding recovery board under chapter 77.85 RCW;
- Hatcheries of federally approved tribes in Washington to whom eggs are moved, not sold, under the interlocal cooperation act, chapter 39.34 RCW; and
- Transfer to another resource manager program such as CCT, YN, or USFWS program;
- Governmental hatcheries in Washington, Oregon, and Idaho;
- Placement of fish into a resident fishery (lake) zone, provided disease risks are within acceptable guidelines; or
- Culling for diseases such as BKD and IHN, consistent with the Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State; or
- Distribution to approved organizations/projects for research.

In the event that a production overage occurs after the above actions have been implemented or considered, and deemed non-viable for fish health reasons in accordance with agency aquaculture disease control regulations (i.e. either a pathogen is detected in a population that may pose jeopardy to the remaining population or other programs if retained or could introduce a pathogen to a watershed where it had not previously been detected) then culling of those fish may be considered.

All, provisions, distributions, or transfers shall be consistent with the department's egg transfer and aquaculture disease control regulations as now existing or hereafter amended. Prior to department determination that eggs of a salmon stock are surplus and available for sale, the department shall assess the productivity of each watershed that is suitable for receiving eggs.

10.9) Fish health certification procedures applied pre-release.

All fish are examined for the presence of "reportable pathogens" as defined in the PNFHPC disease control guidelines, within 3 weeks prior to release. Fish transferred into the sub-basin are inspected and accompanied by notifications as described in IHOT and PNFHPC guidelines.

10.10) Emergency release procedures in response to flooding or water system failure.

Ringold Springs Hatchery and the I-182 Acclimation Site: Outlet screens/boards to rearing systems would be pulled, and fish would be allowed to volitionally move out of facility.

10.11) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

To minimize interactions with any listed species in the mainstem Columbia River, smolts are released full term when they are expected to promptly out-migrate rather than interact with any listed species. **See Section 2.2.3.**

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1) Monitoring and evaluation of "Performance Indicators" presented in Section 1.10.

11.1.1) Describe plans and methods proposed to collect data necessary to respond to each "Performance Indicator" identified for the program.

WDFW M&E staff dedicated to Ringold Springs Hatchery and lower Yakama River work in conjunction with The Yakama Nation M&E staff, fish culture staff, the Columbia River Coded Wire Tag Recovery Program (CRCWTP), Region 3 Fish Management, the WDFW District 4 Fish Biologist, Upper Columbia River Steelhead Monitoring and Evaluation Team, and the GCPUD Research Science team to complete various tasks included in the annual M&E SOW for Ringold Springs fall Chinook. Samples collected at the hatchery and in the field are to be analyzed by WDFW Labs including the Scale Reading Lab, Coded Wire Tag Lab, Genetics Lab, and the Otolith Lab. Data and analysis collected in association with the Ringold Springs Hatchery M&E and Hanford Reach population monitoring is to be incorporated into the WDFW Traps, Weirs, and Surveys database for use in research and managing fall Chinook salmon populations in the Columbia and Snake Rivers and tributaries.

WDFW M&E staff will perform systematic biological sampling during all adult trapping and spawning operations. A variety of field methods will be used to collect the data necessary to achieve M&E objectives. Methods include, but are not limited to, redd surveys, carcass surveys, adult trapping, data collection at the hatchery during spawning, data collection at the hatchery during rearing, juvenile collection and tagging in the natural environment, and disease monitoring. The Hatchery M&E biologist will calculate annual fisheries contribution rates based on coded-wire tag recoveries in regional commercial and sport fisheries. Continue use of mass marked (ad clip) and coded-wire tagged groups as effective management and research tool. An annual representative PIT tagging program will be implemented at Ringold Hatchery for the purpose of evaluating both juvenile and adult migration timing and survival through the hydro-system and the effect of expanded releases from Ringold Hatchery on straying into the Snake River Basin; potentially affecting the listed Snake River fall Chinook ESU..

Performance indicators will be reviewed annually. The work plan (SOW) will be modified annually if changes are warranted to assess these performance indicators.

11.1.2) Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

See Section 1.10.

11.2) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.

Monitoring, evaluation and research follow scientific protocols with adaptive management process if needed. WDFW will take risk aversion measures to eliminate or reduce ecological

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effects, injury, or mortality as a result of monitoring activities. Most trap mortalities are the result of extreme environmental conditions that flood traps or equipment failure. WDFW will take precautions to make sure the equipment is properly functioning during the season. If environmental conditions are forecast that will cause high mortality, traps will be removed or opened to allow unobstructed passage without mortality. Any take associated with monitoring activities is unknown but all follow scientific protocols and "Best Practices" designed to minimize impact.

SECTION 12. RESEARCH

12.1) Objective or purpose.

A. Monitoring and evaluation of fall Chinook salmon released from Priest Rapids Hatchery and Ringold Springs
   1) Determine effects of Priest Rapids program on natural-origin fish abundance and productivity, and genetic diversity in the Hanford Reach (Pearsons and Langshaw, 2008).
   2) Determine if the run timing, spawn timing, spawning distribution, and survival of both the natural and Priest Rapids Hatchery components of the Hanford Reach population are similar.

B. Evaluation of new Ringold Springs Hatchery facilities and operations.
   1) Ability of hatchery discharge channel and volunteer trap to attract and provide access to adults returning to the hatchery.
   2) Trap efficiency and adult holding capabilities, including ease of operations for surplusing, sampling, and collection and transport of brood stock to adult holding ponds/raceways.
   3) Adequacy of incubation and early rearing facilities.
   4) Evaluation of rearing facilities (raceways) including feeding, cleaning, flow, mortality (susceptibility and enumeration), predation, and release.

C. Evaluation of I-182 acclimation facility
   1) Evaluation of rearing facilities (raceways) including feeding, cleaning, flow, mortality (susceptibility and enumeration), predation, and release.

D. With the potential for an increase in fall Chinook production at the Ringold Springs facility and the installation of a new acclimation site, additional research evaluations will likely be identified to address specific needs or concerns.

12.2) Cooperating and funding agencies.

A. Ringold Springs Hatchery
   1) U.S Army Corps of Engineers- Funding per John Day Mitigation.
   2) Washington Department of Fish & Wildlife - Ringold Spring Hatchery rearing, acclimation, and release.
   3) Yakama Nation/Confederated Tribes of the Umatilla Indian Reservation – I-182 adult collection, acclimation and release.

B. **Priest Rapids Monitoring and Evaluation**
   A. Grant County PUD mitigation for Priest Rapids and Wanapum dams

C. **Hanford Reach Monitoring Program**
   A. Columbia River Coded Wire Tag Recovery Program,
   B. CRITFC

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12.3) Principle investigator or project supervisor and staff.

A. **Ringold Springs Hatchery Test Facility**
  B. Steve Richards, Hatchery M&E Biologist, WDFW Fish Program, Region 3
  C. Anthony Fritts and Andrew Murdoch- WDFW Fish Program, Science Division

B. **Priest Rapids Hatchery Monitoring and Evaluation**
  D. Steve Richards, Hatchery M&E Biologist, WDFW Fish Program, Region 3
  E. Anthony Fritts and Andrew Murdoch- WDFW Fish Program, Science Division
  F. Todd Pearsons, Grant County PUD (Ephrata)

C. Yakima River Monitoring and Evaluation
  A. Bill Bosch, Yakama Nation

12.4) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.

1) Snake River spring/summer Chinook, fall Chinook, sockeye, coho, and steelhead stocks
2) Columbia River spring/summer Chinook, fall Chinook, sockeye, coho, and steelhead stocks
3) Columbia/Snake bull trout

12.5) Techniques: include capture methods, drugs, samples collected, tags applied.

A. **Ringold Springs Hatchery Monitoring and Evaluation**
  1) Capture of hatchery juvenile fish from rearing vessels
  2) Application of tags (CWT and PIT) to experimental treatment groups.
  3) Passive detection of PIT tagged fish (downstream and upstream migrants) at McNary, John Day, and Bonneville projects.
  4) Handling and discrimination of adult returns for adipose/CWT marks.
  5) Systematic biological sampling for length, age (scales), gender, and marks.

B. **Priest Rapids Hatchery Monitoring and Evaluation**
  1) Redd surveys (foot and boat), adult counts at dams, carcass surveys, Priest Rapids Hatchery trap sampling, hatchery spawning sampling, harvest sampling,
  2) Marking (adipose fin-clip and otolith marking) and tagging (CWTs and PIT-tags) juvenile hatchery fall Chinook.
  3) Juvenile abundance monitoring (beach seines)

12.6) Dates or time period in which research activity occurs.

  1) **Ringold Springs Hatchery Monitoring and Evaluation** Adult trapping/ponding/surplus September-December
  2) Adult spawning = October-November
  3) Juvenile incubation/early rearing = October-March
  4) Juvenile rearing/marking/release = March-July
  5) Juvenile monitoring and discrimination at McNary, John Day, and Bonneville projects = June-October
  6) Adult monitoring and discrimination at McNary, John Day, and Bonneville projects = July-November.

A. **Ringold Springs Hatchery fall Chinook Monitoring and Evaluation**

Task	J	F	M	A	M	J	J	A	S	O	N	D
Redd surveys										x	x	x
Dam counts								x	x	x	x	
Carcass surveys										x	x	x
Hatchery Trap sampling									x	x	x	
Hatchery spawning sampling										x	x	
Harvest sampling								x	x	x		

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Juvenile monitoring in hatchery			x	x	x	x						
Tagging juveniles in the Hanford Reach					x	x						

Source: Priest Rapids Hatchery Fall Chinook Salmon Monitoring and Evaluation Plan, (Pearsons and Langshaw, 2009).

12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.

A. **Ringold Springs Hatchery Test Facility**

1) Test/treatment juvenile fish (control and two treatments) are retained in duplicate raceways (3) at Ringold Springs Hatchery during May and June.
2) Test/treatment juvenile fish (control and two treatments) are volitionally released from Ringold Springs Hatchery at ~50 fpp in June.

B. **Priest Rapid Monitoring and Evaluation**

Not applicable

12.8) Expected type and effects of take and potential for injury or mortality.

A. **Ringold Springs Hatchery Test Facility**

1) Test/treatment fish are handled in rearing vessels where listed species have no access.
2) Test/treatment fish are passively discriminated at McNary, John Day, and Bonneville Hatchery.
3) Test/treatment fish are not expected to impact listed fish significantly relative to competition for food and space since RSH fish are smolted and move through the river system quickly.

B. **Priest Rapid Monitoring and Evaluation**

1) *Redd counts/dam counts*: not applicable
2) *Carcass surveys*: takes place in approximately five rivers; reaches for the Priest Rapids Pool will be determined – not applicable
3) *Priest Rapids trap*: sample all fall Chinook that are not used for broodstock (about 13,000 fish) for CWT and then about 10% (1,300) of these fish for otoliths, age, gender, and origin.
4) *Hatchery spawner sampling*: not applicable
5) *Harvest sampling*: not applicable
6) *Fish culture monitoring*: not applicable
7) *Beach seine*: Mark 200,000 naturally-produced juvenile Chinook salmon with CWTs.

12.9) Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached "take table" (Table 1).

Not applicable.

12.10) Alternative methods to achieve project objectives.

Not applicable.

12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.

Not applicable.

12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.

Not applicable.

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the information provided is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

Name, Title, and Signature of Applicant:

Certified by______________________________ Date:_____________

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ADDENDUM A. PROGRAM EFFECTS ON OTHER (AQUATIC OR TERRESTRIAL) ESA-LISTED POPULATIONS. (Anadromous salmonid effects are addressed in Section 2)

15.1) List all ESA permits or authorizations for USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species associated with the hatchery program.

The WDFW and the USFWS have a Cooperative Agreement pursuant to section 6(c) of the Endangered Species Act that covers the majority of the WDFW actions, including hatchery operations.

> "The department is authorized by the USFWS for certain activities that may result in the take of bull trout, including salmon/steelhead hatchery broodstocking, hatchery monitoring and evaluation activities and conservation activities such as adult traps, juvenile monitoring, spawning ground surveys..."

15.2) Describe USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species and habitat that may be affected by hatchery program.

Columbia Basin DPS Bull Trout (*Salvelinus confluentus*): Bull trout were listed as threatened in June 1998 (63 FR:31647-31674). Critical habitat was designated in 2005 (70 FR 56211 56311). A recovery plan was drafted in 2005 and has not been finalized. A 5-year review was finalized in 2008. In January 2010, the USFWS proposed a revision of critical habitat.

Status: The Columbia River DPS occurs throughout the entire Columbia River basin within the United States and its tributaries. The Columbia River population segment is composed of 141 subpopulations.

The Middle Columbia Recovery (MCR) Unit encompasses the Yakima River basin to the confluence with the Columbia River. The Yakima River basin is located in south central Washington, draining approximately 6,155 square miles. It is bounded on the west by the Cascade Range, on the north by the Wenatchee Mountains, on the east by the Rattlesnake Hills, and on the south by the Horse Heaven Hills. The entire basin lies within areas either ceded to the United States by the Yakama Nation or areas reserved for their use. The MCR Team identified a single core area encompassing the Yakima River basin and includes 13 extant local populations, with the mainstem Columbia River considered to contain core habitat which may be important for full recovery to occur. Local populations that are considered essential for recovery include: Ahtanum (including North, South, and Middle forks), Upper Yakima mainstem (Keechelus to Easton), Rattlesnake Creek, North Fork Teanaway River, Upper Cle Elum River, American River, Crow Creek, South Fork Tieton River, Indian Creek, Deep Creek, Box Canyon Creek, Upper Kachess River (including Mineral Creek), and Gold Creek. In addition to the aforementioned local populations, bull trout should be established in the Middle Fork Teanaway River, Taneum Creek, and the North Fork Tieton River.

The Upper Columbia Recovery (UCR) Unit Team identified three core areas including the mainstem and tributaries of the Wenatchee, Entiat, and Methow Rivers. The 16 identified local populations are currently distributed within the Wenatchee (6), Entiat (2) and Methow (8) core areas and are comprised of the migratory life-history form.

> **Changes in the Status of the Columbia River Interim Recovery:** The overall status of the Columbia River interim recovery unit has not changed appreciably since its listing on June 10, 1998. Populations of bull trout and their habitat in this area have been affected by a number to actions addressed under Section 7 of the ESA. Most of these actions resulted in degradation of the environmental baseline of bull trout habitat, and all permitted or analyzed the potential for incidental take of bull trout. The Plum Creek

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Cascades HCP, Plum Creek Native Fish HCP, and Forest Practices HCP addressed portions of the Columbia River population of bull trout.

Several other listed and candidate species are found in Benton, Franklin, Grant, Kittitas and Yakima Counties; however the hatchery operations and facilities for this program do not fall within the critical habitat for any of these species. As such there are no effects anticipated for these species.

“No effect” for the following listed species:

Listed or candidate species:

“No effect” for the following species:

Canada lynx *(Lynx canadensis)* –Threatened [critical habitat designated]
Gray wolf *(Canis lupus)* –Threatened
Grizzly bear *(Ursus arctos horribilis)* –Threatened
Marbled murrelet *(Brachyramphus marmoratus)* –Threatened [critical habitat designated]
Northern spotted owl *(Strix occidentalis caurina)* –Threatened [critical habitat designated]
Gray wolf (*Canis lupus*) –Threatened
Pygmy rabbit (*Brachylagus idahoensis*) – Columbia Basin DPS –Threatened
Ute ladies’-tresses (*Spiranthes diluvialis)* –Threatened
PROPOSED
White Bluffs bladderpod (Physaria douglasii subsp. tuplashensis) [critical habitat designated]
Eriogonum codium (*Umtanum desert buckwheat*) [critical habitat designated]
CANDIDATE
Greater sage grouse (*Centrocercus urophasianus*) **-** Columbia Basin DPS
Yellow-billed cuckoo (*Coccyzus americanus*)
Washington ground squirrel (Spermophilus washingtoni)
Greater sage grouse *(Centrocercus urophasianus)* – Columbia Basin DPS
Northern Wormwood (*Artemisia campestris* ssp. *borealis* var. *wormskioldii*)
Fisher *(Martes pennanti)* - West Coast DPS
North American wolverine *(Gulo gulo luteus)* – contiguous U.S. DPS
Whitebark pine (*Pinus albicaulis*)
Mardon skipper *(Polites mardon)*

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15.3) Analyze effects

Hatchery activities, including broodstock collection, hatchery trap, and water intake structures may pose a risk to system bull trout populations. Annual estimates of bull trout encounters through the hatchery activities are recorded and reported.

15.4) Actions taken to minimize potential effects.

Trap is checked at least daily. Any bull trout encountered at the trap are immediately returned to the stream. Bull trout may be encountered in other hatchery programs during broodstock collection activities (steelhead) that would directly impact or create potential effects on bull trout in this system based on the current understanding of the status of these fish.

The Hatchery and Supplementation Plan will include measures to minimize the potential negative impacts of hatchery fish on bull trout and other ESA-listed species (SA 8.2.2.10).

15.5) References

U.S. Fish and Wildlife Service. 2002. Chapter 21, Middle Columbia Recovery Unit, Washington. 97 pp. *In*: U.S. Fish and Wildlife Service. Bull Trout (*Salvelinus confluentus*) Draft Recovery Plan. Portland, Oregon.
and

U.S. Fish and Wildlife Service. 2002. Chapter 22, Upper Columbia Recovery Unit, Washington. 127 pp. *In*: U.S. Fish and Wildlife Service. Bull Trout (*Salvelinus confluentus*) Draft Recovery Plan. Portland, Oregon.

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Appendix 1

John Day Mitigation Hatchery Monitoring and Evaluation for Ringold Springs Hatchery and the Interstate 182 Facility

Draft Statement of Work

Fall-Run Upriver Bright Chinook Salmon

Submitted by: Washington Department of Fish & Wildlife

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Performance Period: Annually July 1, 20XX to June 30, 20XX

Date of Submission: Draft: February 2014

Introduction

In 2012, the Portland District USACE produced the John Day Mitigation Alternative Study. The purpose of the study is to evaluate alternatives for increasing the number of upriver bright fall Chinook through the Zone 6 Tribal Fishery (Bonneville to McNary Dams), while minimizing effects on Endangered Species Act (ESA) listed Lower Columbia River Chinook. Many details have not been finalized at this time including whether adults will be spawned, transported, or surplus at the I-182 facility as well as each Agency's responsibility for the production and monitoring of these releases. This draft SOW is provided as a guideline for monitoring and evaluation of increased juvenile fall Chinook salmon releases at Ringold Springs Hatchery and releases at the I-182 facility and covers a comprehensive M&E program for both release sites.

The Washington Department of Fish & Wildlife (WDFW) operates Ringold Springs and Priest Rapids Hatcheries located along the Columbia River within the area known as the Hanford Reach. Both facilities are operated as integrated hatcheries. Ringold Springs Hatchery (RSH) is owned by the WDFW and funded through multiple State and Federal programs. The fall Chinook program at RSH is funded by the United State Army Corps of Engineers (USACE) for mitigation of John Day Dam. In July 2011, an annual monitoring and evaluation program was established for RSH with funding provided by the USACE.

WDFW began a comprehensive Monitoring and Evaluation Program (M&E) for the Hanford Reach and Priest Rapids Hatchery in 2010 and Ringold Springs Hatchery in 2011. Though the comprehensive M&E programs are relatively recent, WDFW has been has been conducting monitoring and evaluation of URB fall Chinook in the Hanford Reach dating back to the early 1980's monitoring the sport fishery, hatchery returns, and escapement for run reconstruction and coded wire tag returns. In 1998, WDFW began a project to improve coded-wire tag sampling of natural and hatchery URB fall Chinook populations in the Hanford Reach, Columbia River, and lower Yakima River. As part of this process, WDFW began to survey the lower Yakima River for fall Chinook spawning abundance and population age structure. Prior to the work conducted in 1998, no fall Chinook population estimates existed for the lower Yakima River portion of the Upper Columbia Up River Bright stock.

This Statement of Work (SOW) incorporates the methods and protocols for M&E of hatchery releases of fall Chinook in the Hanford Reach. This SOW lists all objectives and tasks as well as the agency responsible for funding, staffing, supervision, data collection, analysis, and reporting for the period of adult return through juvenile release.

Project Coordination

WDFW M&E staff dedicated to RSH and the I-182 facility will work in conjunction with fish culturist staff from both facilities, the Columbia River Coded Wire Tag Recovery Program (CRCWTP), Region 3 Fish Management, UCR Steelhead Monitoring and Evaluation, the Grant County PUD Research Science team, and the USACE to complete all tasks included in the M&E Plans. Samples collected at the hatcheries and in the field will be analyzed by WDFW Labs including the Scale Reading Lab, Coded Wire Tag Lab, and the Otolith Lab. Data collection associated with the M&E programs and the Hanford Reach fall Chinook salmon population monitoring is incorporated into the WDFW Traps, Weirs, and Spillways (TWS) data base which is used for forecasting and managing salmon returns to the Columbia River. WDFW will secure and hold all permits necessary for work that is described in this statement of work. Data collection, design, review, analysis, and reporting will be completed as a combined effort between WDFW, USACE, GCPUD, Yakama Nation, and Confederated Tribes of the Umatilla Indian Reservation biologists.

Objectives

The objectives of the M&E programs are to evaluate the performance of the two release programs relative to the goals and objectives defined in the Hatchery Genetic Management Plans (HGMP). The overarching goal of the Ringold Springs and I-182 facility M&E programs is to meet the USACE John Day mitigation obligations by producing fish for harvest while keeping genetic and ecological impacts within acceptable limits.

Objective 1: Determine if the John Day Mitigation Hatchery programs at Ringold Springs Hatchery and the I-182 facility have affected abundance and productivity of the Hanford Reach or Yakima River populations.

Objective 2: Determine if the run timing, spawn timing, and spawning distribution of both the natural and hatchery components of the populations are similar.

Objective 3: Determine if genetic diversity, population structure, and effective population size have changed in natural spawning populations as a result of the John Day Mitigation Hatchery program. Additionally, determine if Hatchery programs have caused changes in phenotypic characteristics of the Hanford Reach or Yakima Rivers populations.

Objective 4: Determine if the Ringold Springs Hatchery adult-to-adult survival (i.e., hatchery replacement rate) is greater than the Hanford Reach adult-to-adult survival (i.e., natural replacement rate) and equal to or greater than the program specific hatchery replacement rate (HRR) expected value based on survival rates listed in the BAMP (1998).

Objective 5: Determine if the stray rate of John Day Mitigation fish into the Hanford Reach and lower Yakima River is below the acceptable levels to maintain genetic variation between stocks.

Objective 6: Determine if hatchery fish were released at the programmed size and number.

Objective 7: Determine if harvest opportunities have been provided from returning adults.

Objective 8: Determine if the hatchery releases have increased pathogen type and/or prevalence in the Hanford Reach or Yakima River populations.

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Methods

The M&E plan is primarily organized in tables to facilitate review and provide clear direction for implementation. This plan was designed to be consistent with M&E plans that were designed and are currently being implemented by Grant, Chelan and Douglas PUDs (e.g., Murdoch and Peven 2005; Cates et al. 2007, Hays et al. 2007, Richards. 2013). A variety of field methods will be used to collect the data necessary to achieve M&E objectives. Methods include redd surveys, carcass surveys, adult trapping, data collection at the hatchery during spawning, data collected at the hatchery during rearing, juvenile collection and tagging in the natural environment, disease monitoring, and NTTOC monitoring in the natural environment, if identified as necessary in a risk assessment.

Tagging and marking will be an essential component of apportioning hatchery and natural origin production and stray rate. All of the hatchery origin fish will be adipose clipped prior to release and a representative group will be coded-wire tagged (CWT) from each release site. In addition, a PIT tag release group has been proposed for both sites.

The following Tasks are necessary to meet the Objectives of the Ringold Springs Hatchery and I-182 M&E Plans (some of these tasks are funded wholly or in part by other organizations):

Task 1. Sampling of adult returns at the volunteer trap

Task 1.1. Ringold Springs Hatchery

Task 1.2. I-182 Facility

Task 2. Sampling of adult returns during spawning

Task 2.1. Ringold Springs Hatchery

Task 2.2. I-182 Facility[1]

Task 3. Compilation of hatchery origin URB fall Chinook salmon in the sport harvest including the Hanford Reach, Yakima River, Wanapum Tribal Fishery, ocean, and lower Columbia commercial and tribal harvest

Task 3.1. Hanford Reach sport fishery

Task 3.2. Lower Yakima River sport fishery

Task 3.3. Wanapum Tribal Ceremonial and Subsistence fishery

Task 4. Redd surveys in the Hanford Reach and lower Yakima River

Task 4.1. Hanford Reach aerial redd counts

Task 4.2. Lower Yakima River redd counts

Task 5. Adult counts at dams and hatcheries

Task 6. Carcass surveys in the Hanford Reach and Yakima River

Task 6.1. Hanford Reach stream survey

Task 6.2. Lower Yakima River stream survey

Task 7. Juvenile marking and tagging for John Day mitigation releases in the Hanford Reach and lower Yakima River

Task 8. Juvenile marking and tagging of the Hanford Reach natural population

Task 9. Sampling at the fish ladder trap (OLAFT) for run reconstruction and potential broodstock collection

Task 10. Operation and evaluation of PIT tag detections at the Ringold Springs[2], I-182 Facility, and Priest Rapids Hatchery discharge channel and derived estimates from dams.

Task 11. Sampling of natural origin brood stock collected from other sources.

[1] Fall Chinook may be spawned at the I-182, adults transported off site, or egg takes may be obtained from Ringold Springs Hatchery or other facility. Staff associated with spawning may need to travel to alternative location or these activities may be completed at the alternative location with existing staff

[2] PIT tag arrays are proposed for Ringold Springs Hatchery and I-182 facility

Tasks

Task 1. Sampling Information, Methods, and Metrics for Data Collected at the Ringold Springs Hatchery and I-182 Volunteer Traps

Objectives: 1, 2, 3, 4, & 5

Sample Unit: Fish surplused. Fish transported from the trap and ponded for broodstock are included in Task 2.1 & 2.2.

Sample Size: Sample all Chinook that are not used for broodstock to determine adult, jack, and gender proportion of the return and recover coded wire tags to determine origin and calculate SARs. Approximately 10% of the Chinook surplused at the trap will be sampled for run reconstruction (length & age). The sample goal at the trap is 1,000 fish.

Schedule: September 1 through December 15

Methods: All Chinook salmon will be scanned for the presence of CWTs. All Chinook salmon with a CWT present will be sampled for age (scale sample), gender, fork length, and the snout removed, bagged and labeled for processing at the WDFW Pasco office. Fish will be systematically sampled (e.g., 1 in 10) for run reconstruction when the trap is operated. If run sizes are low (e.g., <6,000 then a higher proportion may be sampled. Biological information collected includes length, gender, and scale samples for aging.

Data Collected: Scale (age), fork length (length at age), gender, and CWT (origin).

Task 1.1. Population of fish collected at the Ringold Springs Hatchery volunteer trap

Personnel and Equipment: Three full-time M&E technicians, M&E biologist, one vehicle, computer, and sampling equipment. Staff will sample Ringold Springs Hatchery returns at the volunteer trap. Staff will be responsible for biological sampling, data entry, and reading of coded wire tags. CWTs will be read at the WDFW Pasco office. The WDFW Scale Lab will read all scale to age including years in freshwater. Staff will be available on site seven days per week.

Task 1.2. Population of fish collected at the I-182 volunteer trap

Personnel and Equipment: Three full-time M&E technicians, M&E biologist, one vehicle, computer, and sampling equipment. Staff will sample Ringold Springs Hatchery returns at the volunteer trap. Staff will be responsible for biological sampling, data entry, and reading of coded wire tags. CWTs will be read at the WDFW Pasco office. The WDFW Scale Lab will read all scale to age including years in freshwater. Staff will be available on site seven days per week.

Task 2. Sampling Information, Methods, and Metrics for Data Collected at the Ringold Springs Hatchery and I-182 Pond during Holding and Spawning

Objectives: 1, 2, 3, 4, 5, & 8

Sample Size: All Chinook ponded for broodstock and used for egg takes will be sampled to determine adult, jack, and gender proportion of the broodstock and to recover coded wire tags and to determine origin. Up to 700 otoliths from non-mark nor CWT fish will be submitted for determine origin as it relates to estimates of the proportion of natural origin broodstock (pNOB). Approximately 25% of the Chinook used for brood stock will be sampled for run reconstruction (length & age). The sample goal for broodstock is 1,000 fish.

Schedule: October 15 through November 30, 1-3 days per week

Methods: All fish will be wanded for the presence of CWTs. All Chinook salmon with a CWT present will be sampled for age (scale sample), gender, fork length, and the snout removed, bagged and labeled for processing at the WDFW Pasco office. Otoliths will be pulled from broodstock that are not externally marked nor possess a CWT to identify if these fish are from the Priest Rapids non-marked release group. Otolith samples will be submitted to the WDFW Otoliths Lab for decoding. All Chinook salmon sub-sampled for run reconstruction and origin will be sampled for age (scale samples), gender, and fork length. Fish are systematically sampled (e.g., 1 in 4) during spawning operations. Fecundity will be collected during sampling. Ovarian fluid will be drained from the egg takes of females sub-sampled for fecundity, eggs will then be weighed, and 100 eggs will be collected and weighed to estimate fecundity for the female. Scales and length will be collected for each female in the sub-subsample.

Data Collected: Scale (age), fecundity, egg weight, fork length (length at age), gender, and CWT (origin).

Task 2.1. Population of fish collected at the Ringold Springs Hatchery broodstock

Personnel and Equipment: Five WDFW staff, two vehicles. M&E staff will process CWT samples to determine origin. The WDFW Scale Lab will read all scales to age including years in freshwater. The WDFW Fish Health Specialist will follow disease testing protocols established for WDFW hatcheries. The WDFW Scale Lab will read all scale to age including years in freshwater. Staff will be available on site seven days per week.

Task 2.2. Population of broodstock fish collected at the I-182 facility

Personnel and Equipment: Five WDFW staff, two vehicles. M&E staff will process CWT samples to determine origin. The WDFW Scale Lab will read all scales to age including years in freshwater. The WDFW Fish Health Specialist will follow disease testing protocols established for WDFW hatcheries. The WDFW Scale Lab will read all scale to age including years in freshwater. Staff will be available on site seven days per week.

Task 3. Sampling Information, Methods & Metrics for Harvest Sampling

Objectives: 1, 2, 4, 5, & 7

Sample size: All salmon sampled are scanned for the presence of CWTs. A minimum of 350 Chinook salmon from the sport harvest will be sub-sampled at the appropriate rate (e.g., every 6th fish) to determine origin and other phenotypic metrics; age, gender, and length at age.

Data Collected: Species harvested and released, location, number of boats, number of anglers, effort (angler hours and trailer index counts), catch per unit effort, harvest per unit effort, incidental catch. Biological data will include age (scale), fork length, gender, fecundity, and origin (CWT).

Task 3.1 Hanford Reach Sport Fishery

Frame: Natural and hatchery origin salmon harvested in the Hanford Reach.

Sample Unit: All salmon observed during the Hanford Reach salmon fishery

Schedule: Daily from August 1 through October 31

Methods: Staff will be station at primitive boat launches throughout the Hanford Reach including Vernita Bridge, Waluke, and Ringold. All anglers encountered will be interviewed to determine catch and estimate harvest. Harvested Chinook salmon from these anglers will be sampled to determine origin (CWT), age (scales), gender, and length. Methods are fully described in the WDFW Annual Report (Hoffarth, 2008). Staff start dates are staggered to match angler effort. First staff member starts August 1, two additional staff begin September 1, and remaining staff begins September 15 coinciding with the increase in angler activity. The WDFW District 4 Fish Biologist is responsible for analyzing the data, generating weekly harvest and ESA impact estimates, and evaluating if current harvest is within the harvest guidelines of the Hanford Reach Fall Chinook Harvest Management Plan. Staff from the M&E programs enter all data collected during the sport fishery into the TWS database.

Personnel and Equipment: Creel survey staff and vehicles will be provided and funded by WDFW Region 3 (1), Columbia River CWT Recovery Program (3), Priest Rapids M&E (1), and Ringold Springs M&E (1). M&E staff will process CWT samples to origin and age. The WDFW Scale Lab will read all scale to age including years in freshwater.

Task 3.2 Yakima River Sport Fishery

Frame: Natural and hatchery origin salmon harvested in the lower Yakima River.

Sample Unit: All salmon observed during the Yakima River fall salmon fishery

Schedule: Daily from September 1 through October 22

Methods: The Yakima River is stratified divided into two sections. The first section, extended from the mouth (Highway 240 Bridge) to Horn Rapids (Wanawish) Dam. The second section extended from Horn Rapids Dam upstream to Prosser Diversion Dam. Angler and boat index counts are conducted twice per day. Anglers were interviewed to obtain information on number of hours fished, harvest, and fish released. Harvested fish are sampled to collect fork lengths, scales (aging), and snouts from coded wire tagged fish. Snouts are sent to the WDFW Coded Wire Tag lab for extraction and decoding. The WDFW District 4 Fish Biologist is responsible for analyzing the data, generating weekly harvest and ESA impact estimates, and evaluating if current harvest is within the harvest guidelines. Staff from the M&E programs enter all data collected during the sport fishery into the TWS (run reconstruction) database.

Personnel and Equipment: Creel survey staff and vehicles will be provided and funded by WDFW Region 3 (1) and I-182 M&E (1). M&E staff will process CWT samples to origin and age. The WDFW Scale Lab will read all scale to age including years in freshwater.

Task 3.3 Wanapum Tribal Fall Chinook Salmon Fishery

Sample Size: All Chinook salmon harvested are sampled.

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Schedule: September 1 through October 15

Methods: All Chinook salmon and Coho harvested are sampled to determine origin (CWT), age (scales), gender, and length. Snouts are collected from all adipose clipped Chinook salmon and Coho. These snouts will be scanned with a CWT wand at Priest Rapids Hatchery or the WDFW Pasco office. All snouts with a positive signal will be transported to the WDFW District 4 Office for processing. Methods are fully described in the WDFW Procedures for Sampling the Wanapum Fishery (Hoffarth, 2009).

Data Collected: Species harvested, incidental catch, number of nets, mesh size, age (scale), fork length, gender, and origin (CWT).

Personnel and Equipment: GCPUD Cultural staff will sample the fishery and provide the data and samples to the WDFW District 4 Fish Biologist. The WDFW District 4 Fish Biologist and staff from the CRCWTP enter all data from the fishery. M&E staff will process CWT samples to origin and age. The WDFW Scale Lab will read all scale to age including years in freshwater

Task 4. Sampling Information, Methods, and Metrics for Redd Surveys

Objectives: 1 & 4

Frame: Redds in hatchery discharge channel and the Yakima River below Prosser

Sample Unit: Visible redds located in hatchery discharge channel and the Yakima River

Sample size: Total count of visible redds

Schedule: Weekly between October 22 and November 30

Methods: Foot and boat surveys will be conducted as generally described by Gallagher et al. (2007) and Murdoch et al. (2008). Redds will be identified based upon their relatively clean substrate and a bowl and tail spill morphology.

Data Collected: Redd counts, fish counts (live, dead). Biological data will be collected from carcasses recovered during these surveys. Biological data will include age (scale), fork length, gender, fecundity, and origin (CWT).

Task 4 .1 Hanford Reach Aerial Redd Counts

Redd counts for the Hanford Reach from Priest Rapids Dam downstream to the 300 area are conducted by MSA under funding from the Department of Energy Hanford. Flights are conducted three to five days annually from mid-October to late November. Data is reported to all fisheries agencies following completion of the surveys. WDFW and GCPUD biologists conduct redd counts on Vernita Bar from mid-October to the Sunday prior to Thanksgiving to set the critical dates for spawning and emergence as well as establishing critical flow elevations to be maintained during incubation.

Task 4.2. Yakima River Redd Surveys (RM 8-46)

Sample Unit: Yakima River from Highway 240 bridge upstream to the I82 Bridge located immediately downstream Prosser Dam

Sample Size: All redds observed in the survey will be recorded.

Schedule: Last week of October 22 through November 30, all four sections of river completed weekly, one section per day, boat survey (cataraft)

Methods: Stream surveys are conducted on the lower 74 kilometers of the Yakima River to collect post spawn salmon carcasses and count redds. The lower Yakima River is divided into four sections. Each of the four sections are floated weekly to identify new redd construction and recover post-spawn carcasses.

Data Collected: Scale (age),, fork length, gender, spawn success, CWT (origin), location.

Personnel and Equipment: Two staff provided by the I-182 Facility M&E program, cataraft, two vehicles, and standard sampling equipment.

Task 5. Sampling Information, Methods, and Metrics for Adult Counts at Dams and Hatcheries

Objectives: 1, 2, 3, 4

Frame: Fall Chinook salmon in the Hanford Reach and Yakima River

Sample Unit: Fall Chinook salmon counted at dams or weirs (McNary, Priest Rapids, Ice Harbor, Prosser, Priest Rapids Hatchery trap, Ringold Hatchery trap, I-182 Facility)

Sample Size: Total count or subsample

Schedule: Daily from August 9 through November 15

Methods: Dam counts using observers or video as generally described by Wagner (2007).

Data Collected: Fall Chinook salmon are recorded into two categories based on fork length, adults and jacks. Adults are all Chinook salmon greater than 22 inches in total length.

Personnel and equipment: WDFW District 4 Fish Biologist

Task 5.1. Adult Chinook Salmon Counts at Mainstem Hydroelectric and Diversion Projects

Fish counts at mainstem Projects including the Columbia, Snake, and Yakima Rivers necessary to meet PRH M&E objectives are funded by non-related programs by GCPUD, WDFW, the Army Corps of Engineers, and the Yakama Indian Nation. These data are readily available on the internet and will be downloaded at frequent intervals by the WDFW District 4 Fish Biologist.

Task 5.2 Adult Chinook Salmon Counts at Priest Rapids Hatchery

Hatchery returns to Priest Rapids are enumerated by hatchery staff in coordination with M&E staff.

Task 5.3. Adult Chinook Salmon Counts at Ringold Springs Hatchery

Hatchery returns to Ringold Springs Hatchery are enumerated by hatchery staff in coordination with the Ringold Springs Hatchery M&E staff.

Task 5.4. Adult Chinook Salmon Counts at the I-182 Facility

Hatchery returns to Ringold Springs Hatchery are enumerated by hatchery staff in coordination with the Ringold Springs Hatchery M&E staff.

Task 6. Sampling Information, Methods, and Metrics for Carcass Surveys in the Natural Environment *(Hanford Reach and Yakima River)*

Objectives: 1, 2, 3, 4, & 5

Task 6.1. Hanford Reach Stream Surveys

Sample Unit: Salmon carcasses partitioned by reach, five river reaches have been established in the Hanford Reach:

1 - Vernita Bridge to Priest Rapids Dam
2 - Island #2 to Vernita Bridge
3 - Wooden Powerline Towers to Island #2
4 - Wooded Island to Wooden Powerline Towers
5 – Richland to Wooded Island

Carcasses recovered in the Columbia River immediately downstream of the PRH discharge channel will be included with those Chinook salmon recovered in the discharge channel but will be tracked separately should additional analysis of these fish be necessary. Stream survey crews will also sample in the Priest Rapids Pool two days per week.

Sample Size: All carcasses observed in the surveys will be sampled for the presence of coded wire tags. Approximately 500 carcasses per reach will be sampled in the Hanford Reach for origin based on otoliths. These sampled fish will be used to determine other phenotypic metrics; age, gender, length at age, spawn success in addition to the determination of origin.

Schedule: November 1 through December 15

Methods: All carcasses that are encountered will be collected with a gaff or by hand. Surveys will occur by boat or foot. Methods will generally follow Crawford et al. (2007), Murdoch et al. (2008); and Hoffarth et al. (2008). All Chinook salmon will be wanded for the presence of CWTs. All Chinook salmon with a CWT present will be sampled for age (scale sample), gender, fork length, and the snout will be bagged and labeled for processing by M&E staff. Otoliths will be collected from in-sample fish, placed in a vial, and stored with an appropriate index number. Otoliths will be sent to the WDFW Otolith Lab for decoding to determine if they are Priest Rapids Hatchery origin. Chinook salmon sub-sampled for run reconstruction will be sampled for age (scale samples), gender, fork length, and spawning success. Fish will be identified to gender based on morphology. Female Chinook salmon in the sub-sample will be dissected to determine spawn success based on the percentage of egg retention. Carcasses will be cut in half to avoid duplicate sampling in future surveys.

Data Collected: Scale (age), otolith (PRH origin), fork length, POHP length, gender, spawn success, CWT (origin), location.

Personnel and Equipment: Three crews with a three person crew operating seven days per week; plus PRH M&E staff and CRCWTP staff to post process otoliths and enter data into the data base. This will require a total of 13 field staff, three boats, three vehicles and standard sampling equipment. One crew to be funded and staffed by the CRCWTR Program, second crew by GCPUD under the Priest Rapids M&E program, and the third crew by the USACE under the

Ringold Springs M&E Program. The WDFW Otolith Lab will process otoliths to determine if they are Priest Rapids Hatchery origin. M&E staff will process CWT samples to origin and age. The WDFW Scale Lab will read all scale to age including years in freshwater.

Task 6.1.a. Evaluation of Carcass Recovery Bias on Recovery of Post-spawn Fall Chinook Salmon

Sample Unit: All in-sample carcasses recovered in the Hanford Reach River Survey (Sections 1 – 5)

Sample Size: Approximately 200 of the in-sample carcasses per reach (1,000 total fish) will be recycled to evaluate carcass recovery bias.

Schedule: November 1 through December 15

Methods: During the first four weeks of the carcass survey, 200 fish for each age class (age-2 through 5) from the in-sample Chinook salmon collected will be tagged using a one inch numbered neutral colored plastic tag stapled to the inside of each operculum. These fish will be released at mid river and near shore locations adjacent to the location of recovery. All biological data for each individual will be recorded in addition to collection, release, and recovery locations. Data will be reviewed to determine if there is a collection efficiency bias associated with size, gender, or release location.

Personnel and Equipment: This task will be accomplished under sampling protocols associated with the Hanford Reach river surveys.

Task 6.2. Priest Rapids Pool Stream Surveys

Sample Unit: Priest Rapids Dam upstream to Wanapum Dam

Sample Size: All Chinook salmon observed in the survey will be sampled

Schedule: November 1 through December 15, two days per week

Methods: All carcasses that are encountered will be collected with a gaff or by hand. Surveys will occur by boat. All Chinook salmon will be wanded for the presence of CWTs. Chinook salmon with a CWT present will be sampled for age (scale sample), gender, fork length, and the snout will be bagged and labeled for processing at the WDFW CWT Lab. All Chinook salmon will be sampled for run reconstruction. Sampling will include scale samples (age), gender, fork length, and spawning success. Fish will be identified to gender based on morphology. Female Chinook salmon in the sub-sample will be dissected to determine spawn success based on the percentage of egg retention. Carcasses will be cut in half to avoid duplicate sampling in future surveys.

Data Collected: Scale (age), otolith (PRH origin), fork length, gender, spawn success, CWT (origin), location.

Personnel and Equipment: M&E field staff dedicated to the Hanford Reach stream surveys will accomplish this task as a component of the scope of work for technicians assigned to M&E for the natural environment funded by GCPUD (Listed in this Task above).

Task 6.3. Yakima River Stream Surveys

Sample Unit: Yakima River from the Highway 240 bridge upstream to the I82 Bridge located immediately downstream Prosser Dam

Sample Size: All Chinook recovered will be wanded to recover coded wire tags. Fish will be systematically subsampled to meet a sample goal of 500 fall Chinook.

Schedule: October 22 through November 30, all four sections of river completed weekly, one section per day, boat survey (cataraft)

Methods: All carcasses that are encountered will be collected with a hook or by hand. Surveys will occur by boat. Methods will generally follow Crawford et al. (2007), Murdoch et al. (2008); and Hoffarth et al. (2008). All Chinook salmon will be scanned for the presence of CWTs. All Chinook salmon with a CWT present will be sampled for age (scale sample), gender, fork length, and the snout removed, bagged and labeled for processing at the WDFW Pasco office. Fish will be systematically sampled (e.g., 1 in 2) for run reconstruction to meet a sample goal of 500 fall Chinook. Biological information collected includes length, gender, and scale samples for aging.ook salmon will be wanded for the presence of CWTs. Chinook salmon with a CWT present will be sampled for age (scale sample), gender, fork length, and the snout will be bagged and labeled for processing at the WDFW CWT Lab. Fish will be identified to gender based on morphology. Female Chinook salmon in the sub-sample will be dissected to determine spawn success based on the percentage of egg retention (i.e., ¼, 2/4, ¾, 4/4 (fully spawned). Carcasses will be cut in half to avoid duplicate sampling in future surveys.

Data Collected: Scale (age), fork length, gender, spawn success, CWT (origin), location.

Personnel and Equipment: Two staff provided by the I-182 M&E program, cataraft, two vehicles, and standard sampling equipment

Task 7. Sampling Information, Methods, and Metrics for Data Collected to Monitor Fish Culture of Juveniles

Objectives: 6 & 8

Sample Unit: Representative sample of juveniles prior to release

Sample Size: Approximately 150 fish from each rearing vessel to determine size metrics

Schedule: Prior to release, early June

Methods: Estimate abundance and size at each life stage: egg, transfer to raceways, transfer to ponds, and release. Estimates will be generated by subtracting mortalities at subsequent life stages from estimates of green eggs. The fish health specialist will respond to all fish disease outbreaks at the request of the fish hatchery staff and will visit PRH at least once a month. Water temperatures will be recorded hourly from egg to release.

Data Collected: Abundance, fish per pound, length of individual fish, weight of individual fish, and fish health records

Task 7.1. Ringold Springs Hatchery

Frame: Abundance and size of smolts at Ringold Springs Hatchery at the time of release

Personnel and Equipment: Ringold Springs Hatchery and M&E staff

Task 7.2. I-182 Facility

Frame: Abundance and size of smolts at I-182 Ponds at the time of release

Personnel and Equipment: I-182 facility and M&E staff

Task 8. Sampling Information, Methods, and Metrics to Monitor Natural Origin Juvenile Fish Abundance and Size

Objective(s): 1

Frame: Naturally produced juveniles in the Hanford Reach

Sample Unit: All Chinook salmon collected by beach seine in the Hanford Reach during the CWT tagging program.

Sample Size: Appropriate samples will be taken from both the marked and unmarked Chinook salmon.

Schedule: Late May to Early June (typically 10 day marking program)

Methods: Chinook salmon collected during the CWT marking program will be routinely sampled by length. Mark groups and tag codes will be enumerated. Goal of the marking program is to tag and adipose clip 200,000 of the natural production of fall Chinook salmon in the Hanford Reach.

Data Collected: Total numbers of Chinook salmon collected size at marking, mark numbers.

Personnel and Equipment: Coded wire tag trailer, technicians, supervision by both Columbia River Intertribal Fish Commission (CRITFC) and WDFW. Collection is conducted by the Yakama Indian Nation, Umatilla Indian Nation, and CRITFC.

Task 9. Sampling Information, Methods, and Metrics to Monitor URB Fall Chinook Salmon at the Off Ladder Adult Fish Trap (OLAFT)

Objectives: 5

Frame: Run of the River URB Fall Chinook salmon at the OLAFT at Priest Rapids Dam

Sample Unit: All Chinook salmon collected at the OLAFT.

Sample Size: Sample size will vary dependent upon returns and days available to sample. Goal is to collect a minimum of 350 samples.

Schedule: September 1 to no later than November 15

Schedule may vary dependent upon staff availability and fish passage. Program will end if insufficient numbers of Chinook salmon are passing through the fish ladders.

Methods: Chinook salmon will be collected and sampled in conjunction with the UCR Steelhead Monitoring and Evaluation Program. All Chinook salmon encountered during operation of the OLAFT will be diverted to a separate holding and handling location dedicated to the fall Chinook salmon sampling. Chinook salmon will not be anesthetized during handling. Fin clips, fork length, and gender will be recorded and scales will be collected to determine age. Chinook salmon will be scanned for the presence of CWTs but no lethal sampling will occur. All data will be entered into a data base to be used for run reconstruction of the above Priest URB fall Chinook salmon population. Methods and protocols may be modified with the approval of the appropriate Agencies/Committees to accommodate additional Programs, such as, adult broodstock collection, PIT tagging/PIT tag detection.

Data Collected: Total numbers of Chinook salmon collected, marks (fin clips), CWT presence, fork length, age (scales), and gender.

Personnel and Equipment: Staff will be provided by the CRCWT Program, PRH M&E staff when available, and WDFW Steelhead M&E Program. Additional staff will be provided by the host Agency if sampling is expanded to accommodate special Projects. All equipment will be provided by monitoring/evaluation Programs.

Task 10. Operation and Data Analysis of Passive Integrated Transponder (PIT) tag Detections at the Ringold Springs Hatchery Discharge Channel and I-182 Facility

Frame: Hatchery Juvenile Releases and Adult Returns

Sample Size: Up to 20,000 PIT juvenile fall Chinook salmon released from Ringold Springs Hatchery and the I-182 Facility. The number and origin of adult returns likely to be detected at the array is unknown**.**

Schedule: June 1 to December 15

Methods: PIT tag antennae arrays are proposed to be installed in the hatchery discharge channel of Ringold Springs Hatchery and the adult trap at the I-182 facility. These arrays will provide PIT tag detection of juveniles at release as well as returning adults. The associated M&E staff will monitor PIT detections and analyze results to determine the abundance of both juvenile and adult fall Chinook salmon, travel time and speed of juvenile fish, re-ascension of precocious mini-jacks, and identification of non-facility origin fish. PIT tag detections will be compared against adult detections at hydroelectric projects in the Columbia and Snake rivers to estimate interdam loss, smolt to adult survival to the hatchery, juvenile downstream survival, as well as adult re-ascension and fall back rates at McNary, Ice Harbor and Priest Rapids dams. WDFW maintenance crews will conduct routine maintenance of the PIT tag arrays as needed. An in depth inspection of the arrays will occur during late May prior to the hatchery release of juvenile Chinook salmon and again during late August for preparation for the adult Chinook salmon return.

Task 11. Sampling of natural origin brood stock collected from other sources.

It is anticipated that natural origin brood stock will need to be collected from other sources to meet PNI targets for broodstock for an integrated hatchery program.

Frame: Natural origin broodstock

Sample Size: Sample a representative sample of the collection up to 100%.

Methods: All fish will be wanded for the presence of CWTs. All Chinook salmon with a CWT present will be sampled for age (scale sample), gender, fork length, and the snout removed, bagged and labeled for processing at the WDFW Pasco office. All Chinook salmon sub-sampled for run reconstruction and origin will be sampled for age (scale samples), gender, and fork length. Fish are systematically sampled (e.g., 1 in 4) during spawning operations. Fecundity will be collected during sampling. Ovarian fluid will be drained from the egg takes of females sub-sampled for fecundity, eggs will then be weighed, and 100 eggs will be collected and weighed to estimate fecundity for the female. Scales and length will be collected for each female in the sub-subsample.

Data Collected: Scale (age), fecundity, egg weight, fork length (length at age), gender, and CWT (origin).

Personnel and Equipment: Five WDFW staff, two vehicles. M&E staff will process CWT samples to determine origin. The WDFW Scale Lab will read all scales to age including years in freshwater. The WDFW Fish Health Specialist will follow disease testing protocols established for WDFW hatcheries. The WDFW Scale Lab will read all scale to age including years in freshwater.

Expected Results and Applicability

The WDFW has undertaken a comprehensive management program including M&E of hatchery releases. Historical data has been compiled, reviewed, and reported for Priest Rapids and Ringold Springs Hatcheries fall Chinook programs as well as escapement and harvest data for the Yakima River. The RSH and I-182 Facility M&E programs as defined in this SOW are consistent with the M&E programs currently performed for hatchery programs in the Hanford Reach for URB fall Chinook and with summer and spring Chinook hatchery programs in the upper Columbia River mainstem and tributaries. Data collected would be incorporated into the TWS database that is used to compile all harvest, M&E, and escapement information for the Columbia River. Integration of all hatchery and natural origin information is necessary for management of harvest, escapement, and determination of pNOB, pHOS, and PNI for the Hanford Reach and Yakima River fall Chinook populations.

Data Compilation and Analysis

Data will be routinely entered into an Access and Excel data bases in-season. Age, CWT, and otolith information will be entered into the data base when it returns from the WDFW Labs. Data will be maintained at the WDFW District office in Pasco. Historical data as well as current data will be incorporated into the analysis and reporting for each site specific hatchery and population.

Deliverables

Brief monthly reports will be provided. These reports will include major activities, approximate sample sizes, and a description of difficulties encountered. The purpose of these reports will allow for tracking of the progress of the program and for making in-season adaptations if necessary. All data collected during the field season will be available upon request in an appropriate format (e.g., database files, Excel spreadsheets, Word files).

All data entry will be completed by January 31 following the fall return. The WDFW Annual Reports for the Hanford Reach Sport Fishery, Priest Rapids Hatchery, Hanford Reach Stream Survey, Hanford Reach URB Fall Chinook Escapement, Wanapum Tribal Fisheries, Ringold Spring Hatchery, Yakima River Sport Fishery, and Yakima River Stream Survey will be completed by June 1 annually. A summary of project timelines is provided in Table 1.

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Table 1. Summary of project timelines for data entry, analysis, and reporting July 1 – June 30.

Activity	Dates
Ringold Springs Hatchery & I-182 Facility	
Trapping, Broodstock Collection, and Surplus Operations	September 1 – December 15
Spawning	October 15 – November 30
PIT tag Array Maintenance and Evaluation	July 1 – June 30
Sport Fisheries	
Hanford Reach Fall Chinook salmon Fishery	August 1 – October 22
Yakima River Fall Salmon Fishery	September 1 – October 22
Stream Surveys	
Hanford Reach Stream Survey	November 1 – December 15
Lower Yakima River Stream Survey	October 24 – December 7
Data Entry & Analysis	
Data Entry	September 1 – January 31
Data Review and Analysis	December 1 – May 30
Reporting	
Draft Monitoring and Evaluation Report	May 15
Final Monitoring and Evaluation Report	June 30

Budget

Monitoring and Evaluation of juvenile releases and adult returns of Ringold Springs Hatchery and the I-182 facility origin fall Chinook will be a collaborative effort. The portion of the overall costs of this Program that are to be funded by USACE was developed based on discussions between WDFW, the Confederated Tribes of the Yakama and Umatilla Indian Nations with the potential for modifications and Amendments to the Statement of Work and Budget based on recommendations. Cost to the USACE for the Ringold Springs Hatchery and the I-182 facility is estimated at $418,596 annually (Table 2). This budget reflects M&E operations for staff, equipment, and lab processing fees to sample at Ringold Springs Hatchery, the I-182 Facility, the Hanford Reach sport fishery, and in the stream (carcass) surveys in the naturally spawning population of the Hanford Reach and lower Yakima River.

The majority of the costs associated with monitoring of the Hanford Reach sport fishery will be funded by the CRCWTRP and WDFW. WDFW is proposing to split the costs of funding the lower Yakima River sport fishery and increasing the creel survey staff from one to two temporary positions. Roughly one-third of the cost of field crews to sample the naturally spawning population is expected to be funded by USACE under the RSH M&E Program. A CWT Lab was established by WDFW at the Pasco District office and will be staffed by M&E staff. This will greatly reduce costs in addition to reducing the processing time required to process these large numbers of samples.

Appendix 2

Recommendation for coded wire tagging at the expanded Ringold Springs Hatchery

The fall Chinook salmon program at Ringold Springs Hatchery is planning on a significant expansion in the near future where the number of smolts released on site will increase to 10 million. Another 4 million will be release from a proposed acclimation site on the lower Yakima River. In light of this expansion, it seems prudent that the existing tagging program of approximately 220,000 CWT (Hoffarth and Sorensen 2012) should be reassessed.

We used the methods outlined in Skalski and Townsend (2005; 2007) in an effort to forecast the required number of tagged individuals needed to achieve a desired level of precision for fall Chinook salmon released from the Ringold Springs Hatchery. The RMIS database was queried to obtain release and tag recapture data from 1994-2007. Smolt-to-adult survival (SAR) and the associated standard errors were then calculated for each release. The relationship between the number of tagged individuals and the coefficient of variation (CV) of the SAR estimates was then used to estimate the average level of precision expected for a given release size. The results of this analysis are given in Table 1 and the forecast based on those results in Figure 1.

Table 1. Ringold Springs Hatchery fall Chinook salmon CWT release sizes, SAR's, standard errors of the estimate, and the coefficients of variation for brood years 1993-2007.

BY	Release Size	SAR	SE(SAR)	CV
1993	217,184	0.002571	0.00023	0.089
1994	306,381	0.000154	0.000048	0.309
1995	378,778	0.001327	0.000107	0.081
1996	406,896	0.005561	0.000206	0.037
1997	445,242	0.001097	0.000101	0.092
1998	409,017	0.004286	0.000220	0.051
1999	422,845	0.002004	0.000151	0.075
2000	399,244	0.00107	0.000105	0.098
2001	431,370	0.003698	0.000201	0.054
2002	192,931	0.001233	0.000208	0.169
2003	211,197	0.0003	0.000083	0.278
2004	222,200	0.000058	0.000026	0.456
2005*	4,516	NA	NA	NA
2006	222,706	0.000367	0.000105	0.286
2007	221,951	0.006101	0.000331	0.054

*There was a botulism outbreak at Ringold Springs Hatchery in BY2005.

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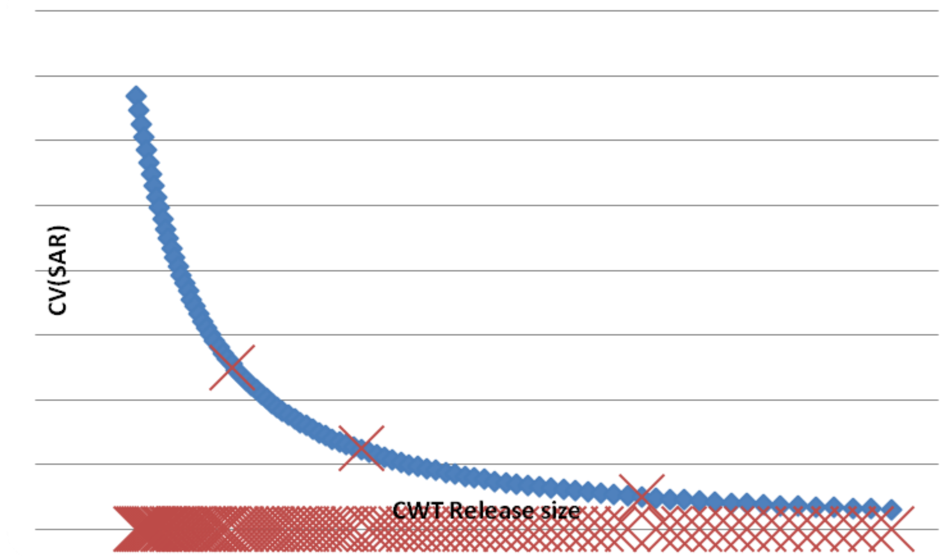

Figure 1. Projected coefficients of variation as a funtion of CWT release sizes of Ringold Springs fall Chinook salmon. The red X's are the points where the precision of 0.25 for rough management, 0.125 for accurate management, and 0.05 for careful research recommended by Robson and Regier (1964) are met.

Given the results based on Figure 1, we project a release size of approximately 174,000, 285,000, and 525,000 would be necessary to achieve the recommended CV's for rough management, accurate management, and careful research, respectively. Skalski and Townsend (2007) recommended adding another 25-50% to the CWT sample size for hatchery programs in the Upper Columbia due to observed interannual variation in survival. Because the predicted values of precision for a particular release size are the average that could be expected over time and the interannual variability in the SAR estimates for Ringold Springs Hatchery fall Chinook salmon is very large (mean SAR = 0.0021, CV = 95%), we recommend a release size of 600,000 CWT fall Chinook at Ringold FH for at least for a generation (5 years) so that we can ensure an acceptable level precision is obtained regardless of the absolute survival in a given year. The recommended size of the CWT group will allow managers to accurately assess the performance of the program in terms of SAR's, harvest, and the proportion of hatchery fish that spawn naturally in Hanford Reach. The recommended size (600K) is also consistent with CWT+AD release group from Priest Rapids FH which would eliminate any uncertainities in comparisons between programs related to sample size. Additionally, because we do not have any data for the proposed acclimation site on the lower Yakima River, we also propose to use this analysis as a surrogate for recommednations related to that program. Therefore, we recommend also releasing 600,000 CWT smolts from the lower Yakima River through the first five years of the program so that we can accurately assess the performance of the new program. After the first 5 years, we will reassess the CWT release size based on oberved data and adjust periodically to ensure hatchery programs are monitored with a reasonble degree of precision. Given the magnitide of the proposed increases in hatchery production and the importance of maintaining the productivity of the Handford Reach fall Chinook popualtion, we believe the recommeded CWT groups are critical in assessing potential negative impacts associated with the harvest hatchery programs within and adjacent to the Handford Reach.

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ON BEHALF OF THE *U.S.V. OREGON* POLICY COMMITTEE

March 7, 2013

Brigadier General Anthony C. Funkhouser, P.E.
Commander, U.S. Army Corps of Engineers
Northwest Division
1125 NW Couch Street
P.O Box 2870
Portland, OR 97208-2870

Dear Brigadier General Funkhouser;

The *US. v. Oregon* Parties have worked in the past year to develop a production plan designed to meet the basic tenets of an improved in-place, in-kind John Day and The Dalles Dam (JD/TD) Mitigation program and reach the 107,000 Total Adult Production (TAP) goal. This correspondence outlines the *US. v. Oregon* Policy Committee's (Policy Committee) consensus plan for restructuring JD/TD to meet those tenets. The Policy Committee consists of representatives from three states, five tribes and three federal agencies. This product was made possible by the joint meetings and the consistent, productive dialogue between the Army Corps of Engineers (COE), the Policy Committee Strategic Work Group and the *US. v. Oregon* Production Advisory Committee (PAC). This restructured JD/TD Mitigation Program plan represents an approach to meeting what the COE presents as its existing congressionally authorized mitigation obligation for the JD/TD program. While there remains some necessary future work on issues outlined by the *US. v. Oregon* Parties' "Weight of Evidence" Document and the COE responses, our intent in this effort is to focus exclusively on the successful completion and implementation of a JD/TD program to mitigate for the loss of 30,000 adult spawning fall chinook.

The goal of this correspondence is to make the transition to the new improved in-place and in-kind JD/TD program, which is biologically sound and consistent with treaty fishing rights, as expedited and seamless as possible. Enclosed is a tabular version of the *U S. v. Oregon* Parties consensus choice for restructuring the JD/TD program. The restructured JD/TD program outlined herein would transition the program from its current 69,900 average TAP level, to an interim level of92,915, before reaching the eventual goal of 107,000. This transition also addresses the expiring Spring Creek Reprogramming Agreement, something that is mutually beneficial to *US. v. Oregon* Parties and the COE. The *US. v. Oregon* Parties understand that our discussions are on-going, but that we and the COE seek a fiscal year (FY) 2014 agreement that would allow implementation of the restructured JD/TD Mitigation plan in FY 2015. The proposal contemplates a transfer of Mitchell Act responsibilities downriver in exchange for all JD/TD mitigation moving upriver. The proposal enables the current production level of tule stock to be maintained while increasing the upriver bright stock production to reach 75% of the total JD/MD production above Bonneville. The states of Washington and Oregon have supported this proposal as a package that increases the overall upriver bright production upstream of Bonneville without reducing the total tule production in the basin. The exchange of Mitchell Act funds downriver in this package causes concern to certain tribal Parties. We understand those Parties may address their concerns to the Corps under separate letter.

Direct technical communication on implementation of this restructured JD/TD Mitigation program can occur at the ongoing *U.S. v. Oregon* PAC and COE monthly coordination meetings. Regular or specially requested updates to the Strategic Work Group and Policy Committee will be provided. If you have any questions regarding this letter or request Policy Committee or Strategic Work Group discussion on this matter, please contact Guy Norman, *US. v. Oregon* Policy Committee Vice-Chair, at 360-906-6704.

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Sincerely,

Guy Norman
Vice Chair
US. V Oregon Policy Committee

Cc: Col. John W. Eisenhauer, Commander, USACE-Portland District
Bernard Klatte, Supervisor of Fisheries Services, USACE, Northwestern Division
Rock Peters, Northwestern Division Fish Program Manager,
USACE George Miller, Project Manager, USACE-Portland District
Jeremy Weber, Planning, Environmental Resources, USACE-Northwestern Division
US. v. Oregon Parties

Appendix 3

Near Term, Interim and Long Term JD/TD Funded Fall Chinook Production Planning to Achieve 107,000 Total Adult Production (TAP) Goal

JD/TD Funded Current Production {FY 2013)

Facility/Release Location	Production Level	Adult TAP@ ave. SARs	
Spring Creek/LWS NFH tules on-station	6,954,000 sub-yearlings	32,844	47%
LWS NFH UBRs trans. to Prosser	170,000 sub-yearlings (feed costs)	338	<1%
LWS NFH URBs on-station	200,000 sub-yearlings (feed costs)	639	1%
Bonneville SH tules on-station	1,596,000 sub-yearlings	1,957	3%
Bonneville SH URBs on-station	2,000,000 sub-yearlings	6,256	9%
Bonneville SH URBs trans. to LWS acclim. pds.	2,500,000 sub-yearlings	7,990	11%
Bonneville SH URBs trans. to Umatilla acclim. pds.	480,000 yearlings	6,395	9%
Bonneville SH URBs trans. to Ringold	3,500,000 sub-yearlings	6,965	10%
Priest Rapids SH URBs on-station	1,700,000 sub-yearlings	6,528	9%
Totals	**19,100,000**	**69,912**	**100%**

JD/TD Funded Interim Production (during Ringold and Prosser/1-182 design and build-out, implementation FY 2015)

Facility/Release Location	**Production Level**	**Adult TAP@ ave.SARs**	
Spring Creek NFH tules on-station	10,500,000 sub-yearlings*	49,592*	53%
Klickitat URBs accl. on-station (from LWSNFH) OR			
LWS NFH URBs on-station (formerly@ Bonn. SH)	2,000,000 sub-yearlings	6,392	7%
LWS NFH URBs on-station via acclim. pd.	2,500,000 sub-yearlings	7,990	9%
LWS NFH URBs trans. to Prosser (now JD/TD funded)	1,700,000 sub-yearlings (new JD/TD)	3,383	4%
Bonneville SH URBs trans. to Umatilla acclim. pds.	480,000 yearlings	6,395	7%
Bonneville SH URBs trans. to Ringold	3,500,000 sub-yearlings	6,965	7%
Bonneville SH URBs trans. to Umatilla acclim. pds.	3,500,000 sub-yearlings (new JD/TD)	5,670	6%
Priest Rapids SH URBs on-station	1,700,000 sub-yearlings	6,528	7%
Totals	**25,880,000**	**92,915**	**100%**

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Appendix 3

JD/TD Funded Long Term Final Production (after Ringold and Prosser/1-182 build-out)

Facility/Release Location	Production Level	Adult TAP@ ave.	SARs
Spring Creek NFH tules on-station	5,664,000 sub-yearlings*	26,751*	25%
LWS NFH URBs on-station (prev. @ Bonn. SH)	2,000,000 sub-yearlings		
OR			
Klickitat URBs acclimate from LWSNFH	2,000,000 sub-yearlings	6,392	6%
LWS NFH URBs on-station via acclim. pd.	2,500,000 sub-yearlings	7,990	7%
Bonneville SH URBs trans. to Umatilla acclim. pds.	480,000 yearlings	6,395	6%
Bonneville SH URBs trans. to Umatilla acclim. pds.	3,500,000 sub-yearlings (new JD/TD)**	5,670**	5%
Bonneville SH URBs trans. to Prosser/1-182 acclim. pds.	858,000 yearlings (new JD/TD)**	11,431**	11%
Ringold SH URBs trans. to Prosser/1-182 acclim. pds.	2,000,000 sub-yearlings (new JD/TD)**	3,980**	4%
Ringold SH URBs on-station	10,000,000 sub-yearlings (exp. JD/TD)	38,400	36%
Totals	**27,002,000**	**107,009**	**100%**

*Note: JD/TD funding responsibility for Spring Creek NFH tule production would be increased to 10.5M smolts (current maximum capacity) as an interim measure to help make progress towards the 107,000 TAP goal during Ringold and lower Yakima River program design and build-out. In addition, JD/TD funding for Spring Creek tules would remain at the 10.5M production level during the 10-year post build-out M&E assessment period (e.g., 2018-2027). This provides additional interim adult TAP production above the final 25% long term Spring Creek TAP level (26,751) as a contingency for shortfalls in new programs until they "prove" themselves under the initial 10-year M&E assessment period.

**These three new JD/TD programs could be adjusted and/or balanced among each other to best fit the current and future circumstances in these tributary locations. However, a new yearling program in the lower Yakima Basin would be a critical component of the overall long term JD/TD program to help achieve the 107,000 TAP goal.

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